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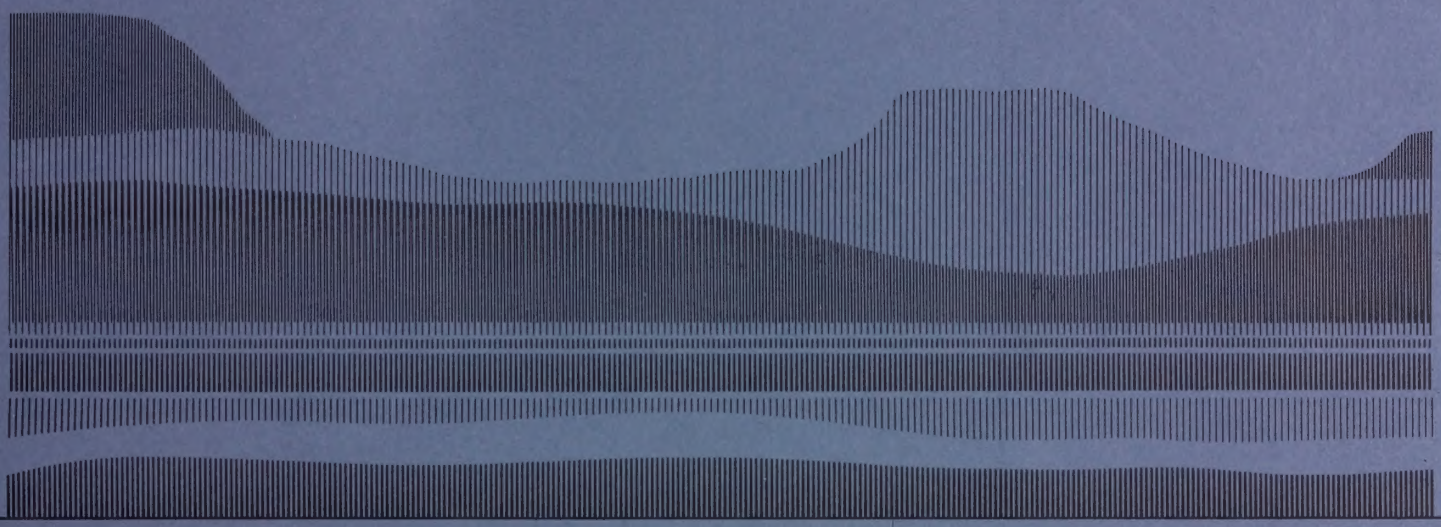

PROPOSED ALL AMERICAN PIPELINE PROJECT

BUREAU OF LAND MANAGEMENT
DEPARTMENT OF THE INTERIOR

ERT
A RESOURCE ENGINEERING COMPANY
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FINAL

SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED ALL AMERICAN PIPELINE PROJECT

Prepared for

BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR
Riverside, California

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Prepared by

ERT, A Resource Engineering Company

November 1987

Ed Hastey

Edward Hastey, California State Director, Bureau of Land Management

COVER SHEET

ALL AMERICAN PIPELINE PROJECT

( ) DRAFT (X) FINAL

Lead Agency	U.S. Department of the Interior Bureau of Land Management California Desert District Riverside, California
Federal Cooperating Agency	U.S. Department of the Interior Fish and Wildlife Service
Texas Cooperating Agencies	Office of the Governor Texas Water Commission Texas Parks and Wildlife Department Texas Historical Commission Texas General Lands Office Edwards Underground Water District Nueces River Authority

Comments on this SEIS should be directed to:

William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507
(714) 351-6428

Date by Which Comments Must be Received: December 28, 1987

ABSTRACT

The All American Pipeline Company has completed construction on about 1,213 miles of their 1,233-mile pipeline to transport California crude oil from both the Santa Barbara Channel and San Joaquin Valley in California to McCamey, Texas. An extension of the All American Pipeline is proposed to transport the crude oil from McCamey to distribution points on the Texas Gulf Coast.

The Texas extension of the All American Pipeline, as proposed, consists of a 486-mile, 30-inch diameter, 300,000 barrels per day (BPD), heated crude oil pipeline. The proposed pipeline originates at an existing tank farm at McCamey, Texas and terminates 454 miles away at a tank farm at Webster with a 32-mile lateral to a marine terminal at Texas City.

The Supplemental Environmental Impact Statement (SEIS) for the proposed All American Pipeline Project analyzes the environmental impacts of the proposed Texas extension of the pipeline and the pump/heater stations through construction, operation, maintenance, and abandonment. This SEIS analyzes the impacts of All American's Proposed Route; two alternative routes - the Northern Alternative and the Southern Alternative; and the No Project Alternative. The Northern and Southern Alternatives were identified to provide optional locations for the pipeline in sensitive areas.

FINAL SEIS USER'S GUIDE

The Final Supplemental Environmental Impact Statement (FSEIS) for the All American Pipeline Project has been prepared in an abbreviated format under Council on Environmental Quality regulations (40 CFR 1503.4 (3)(c). This document should be used in conjunction with, rather than in place of, the Draft SEIS that was released for public review on January 23, 1987.

The FSEIS contains three chapters. The first chapter (Summary) is a summary of the pipeline project that briefly describes the project, areas of controversy, major impact conclusions, and the Federal preferred alternative.

The second chapter (Consultation and Coordination) presents the results of agency and public review of the Draft SEIS. Comments received at public hearings and by letter, and responses to those comments, are presented.

The third chapter (Modifications and Corrections) includes changes made to the text and tables of the Draft SEIS. These have been made in response to public comments and are referenced to the appropriate page number in the Draft SEIS.

The appendices discuss a variety of topics. Appendix A contains an updated and modified set of the mitigation measures and agency stipulations from those presented in the Draft SEIS. Appendix B, the Onion Creek to Edwards Aquifer Oil Spill Scenario, presents a discussion of a catastrophic oil spill. Appendix C contains information concerning consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service pursuant to Section 7 of the Endangered Species Act.

Copies of the Draft SEIS can be obtained by writing to the following address:

District Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

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1.0 SUMMARY AND BLM PREFERRED ALTERNATIVE

1.0 SUMMARY AND BLM PREFERRED ALTERNATIVE

1.1 Introduction

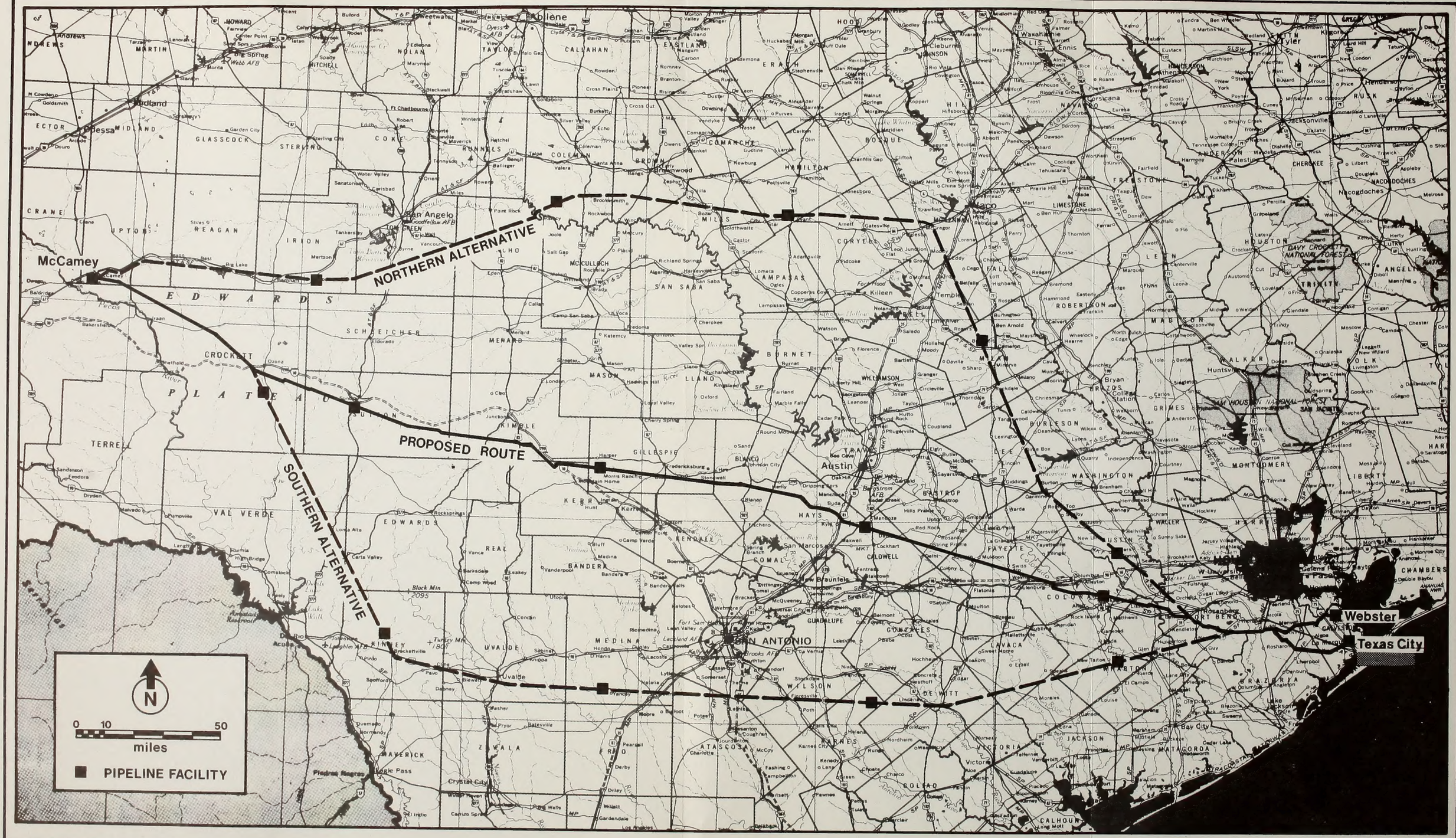
The All American Pipeline Supplemental EIS (SEIS) is a document prepared for the U.S. Department of the Interior, Bureau of Land Management (BLM) to fulfill the requirements of the National Environmental Policy Act (NEPA). The All American Pipeline has been permitted and construction has been completed from Los Flores, California to McCamey, Texas. All American originally proposed to terminate the pipeline at McCamey and to use existing common carrier pipelines to transport the oil from west Texas to the Gulf Coast. However, because of the engineering requirements to upgrade and heat existing lines and because the capacity of the existing lines cannot accommodate the 300,000 barrels-per-day (BPD) volume of All American, All American proposed extension of the pipeline from McCamey to Webster and Texas City, Texas. The proposed line would be 30 inches in diameter, 486 miles long, and would transport 300,000 BPD of crude oil. The Proposed Route would begin at an existing tank farm at McCamey, cross the Edwards Plateau, pass south of Austin, and terminate southwest of Galveston Bay (Map 1-1).

Two alternate pipeline routes were considered: the Northern Alternative and the Southern Alternative. The major siting criteria for the two alternatives were designed to minimize the crossing of suceptible sensitive aquifers, especially the Edwards Aquifer recharge zone. The No Project Alternative considered using existing common carrier pipelines and tankers. Alternatives considered but eliminated included a McCamey to Freeport route and rail and truck transport of crude oil.

All American has applied for and received the federal right-of-way (ROW) grant necessary to cross federal land managed by the BLM, Forest Service, the Air Force, the Army, and the Bureau of Reclamation. This SEIS is based on the United States District Court agreement granting BLM the power to select the pipeline route and to implement mitigation measures identified in the SEIS on private land from McCamey to Webster and Texas City in a manner similar to federal lands elsewhere on the project. The Applicant has also filed for U.S. Army Corps of Engineers (COE) Section 404 and Section 10 permits, a Permit to Operate a Crude Oil Pipeline from the Railroad Commission, and other federal, state, and local permits.

1.2 Areas of Controversy

The primary area of controversy for the Proposed Route and the alternatives is oil spill impacts on sensitive resources. The potential for an oil spill resulting from a pipeline leak or rupture to damage surface water, groundwater, fisheries and wildlife resources, threatened and endangered species, riparian habitat, and recreational resources are the primary concerns. Of special concern is the Edwards Aquifer recharge zone south of Austin.



MAP 1-1 PROJECT LOCATION

1.3 Major Impact Conclusions

The All American Pipeline Project has potential construction and operation impacts. The significant construction impacts focus on loss of riparian habitat and potential loss of threatened and endangered species habitat and individuals, and loss of cultural and paleontological resources. The potential operation impacts would result primarily from oil spill leaks and ruptures. About eight major spills averaging 3,750 barrels are estimated during the 40-year project life. The discharge of oil to a stream or river would potentially cause a significant loss in riparian habitat, threatened or endangered species, fisheries, wildlife, and recreation. The loss of municipal and irrigation water supplies from an oil spill would be significant. Potential impacts are discussed in detail in the Draft SEIS and are supplemented in Chapter 3 Modifications and Corrections of the Final SEIS. The impact summaries in Section 3.4 of the Final SEIS include significant impacts that would result from implementation of the Proposed Route, the Northern Alternative, and the Southern Alternative. The mitigation measures developed for significant impacts are presented in Appendix A of the Final SEIS.

1.4 BLM Preferred Alternative

Federal agencies are required by the Council on Environmental Quality's NEPA regulations (40 CFR 1502.14) to identify their preferred alternative for a project in the Draft and Final EISs prepared for the project. The preferred alternative for the All American Pipeline Project must be one of the four studied by this SEIS: the Proposed Route, the Northern Alternative, the Southern Alternative, or the No Project (project denial) Alternative. The preferred alternative is not a final agency decision. It is instead an indication of the agency's preliminary preference. The final decision will be announced in a Record of Decision issued at least 30 days after the Final SEIS is published.

The Bureau's preferred alternative is the Northern Alternative. The reasons for this choice are summarized below.

The impacts of constructing and operating all three routes across Texas would be similar in many respects. The number and likelihood of crude oil spills is approximately the same for the three routes (about eight over the life of the project), and the average spill size would be the same (about 3,750 barrels). There is little difference in the amount of sensitive soils crossed. No route stands out as likely to affect many more or less cultural sites or paleontological localities than any other. Socioeconomic impacts would be minimal. Air quality effects would be essentially the same (since the same amount of crude would be delivered to Gulf Coast refineries in any case, even if delivered by tanker or existing pipeline under the No Project Alternative).

All three routes could significantly affect riparian, wetland, wildlife, freshwater fisheries, and marine resources should a large spill occur along the routes from the Brazos River to Webster and Texas

City. The threatened bald eagle habitat could be impacted by an oil spill from any of the three routes.

The effects of the alternatives do differ in several ways, however. Significant impacts would occur that would be unique to a given alternative. These differences are addressed by alternative below.

Proposed Route. The Proposed Route crosses the Edwards Balcones Fault Zone Aquifer. The probability of a pipeline break is relatively small (there is about one chance in ten that a major spill would occur along the 6-mile stretch over the 40-year project life). However, should a break occur, crude oil could enter the aquifer in a catastrophic situation (a break near a creek, particularly during a rain). BLM's catastrophic analysis has been reevaluated. As a result, we believe the effects of such a spill could be somewhat more severe than those identified in the Draft SEIS (see Final SEIS Appendix B). All American has already proposed a highly mitigated construction program (seven remote-control valves, trench lining, thick-walled pipe), so most of the reasonable mitigation measures have been included in the project design.

The Proposed Route, like the Northern and Southern Alternatives, could affect several other aquifers. However, it would cross significantly more miles of sensitive aquifers than the Northern Alternative (404 miles rather than 332). All three routes would cross portions of the Edwards Plateau Aquifer, but the Proposed Route would cross a much larger amount. Because both the Edwards Plateau and Edwards Balcones Fault Zone Aquifers are solution limestone formations, an oil spill that reached either aquifer would be difficult if not impossible to clean up. The vulnerability of a sandstone aquifer, such as the Northern Alternative's Carrizo-Wilcox Aquifer is much less, and the feasibility of cleanup is much higher.

Northern Alternative. The route's most significant problem involves river crossings. The Colorado River crossing is in the habitat of the threatened Concho water snake. Without mitigation, populations of the snake could be significantly affected. The route crosses several streams at crossing points above municipal water supplies. However, BLM would require valves (many of them remote-control) at each crossing site, which would greatly reduce the potential amount of oil spilled. Further, it would be much easier to clean up spills into rivers than a comparable spill which entered a limestone solution aquifer such as the Edwards.

The route would cross significantly fewer miles of slopes steeper than 15 percent than the Southern Alternative and slightly fewer than the Proposed Route (13 miles as compared to 30 and 17, respectively). The route mileage across sensitive aquifers (332) would be considerably less than for the Proposed (404 miles) and Southern (418 miles) routes. The Edwards Balcones Fault Zone Aquifer would not be crossed. No streams that interact with the Fault Zone Aquifer and that contain sensitive fish populations would be crossed (compared to two by the Proposed Route and six by the Southern Alternative).

Southern Alternative. Construction difficulties would present the most serious problems with this route due to the rugged, heavily dissected topography that would be crossed. The route would cross twice as many miles of slopes greater than 15 percent than either of the other 2 routes. Nine unstable slope areas would be crossed (compared to five by the Northern Alternative and one by the Proposed Route). Significantly more miles of slopes steeper than 15 percent would be encountered. These problems could not be mitigated.

Several other significant problems would occur. The route would disturb twice as many acres of riparian vegetation as either the Northern Alternative or the Proposed Route (260 compared to 121 and 138, respectively). Although the Edwards Balcones Fault Zone Aquifer would not be crossed, the route crosses six streams containing important fish populations that interact with the aquifer (compared to two for the Proposed Route and none for the Northern Alternative). An estimated 1,300 residences would be subject to construction noise levels in excess of 65 dBA (compared to 750 for the Northern Alternative and 500 for the Proposed Route). Rivers would be crossed at lower points, closer to coastal estuaries.

No Project Alternative. All American may ship its crude through the existing pipeline grid from west Texas to the Gulf Coast. Between 1.5 and 2.0 million barrels per day of pipeline capacity serves west Texas; the actual amount of crude being shipped is not available. There are 12 existing pipelines that could service the All American Pipeline from McCamey and they are all at least 25 years old. Five of these pipelines would cross the Edwards Balcones Fault Zone Aquifer. Since the existing pipelines are older and do not have the same technology as All American, they would have a higher frequency of spills and ruptures. One of the largest of these, Shell Pipeline Company's 24-inch Rancho Pipeline, was cut in May 1986 near Austin, spilling at least 2,400 barrels where it crossed the Edwards Balcones Fault Zone Aquifer. Some lines would have to be retrofitted or rebuilt to ship heavy crude.

If not shipped by pipeline, the crude could be moved by tanker. Tankers would have a greater risk of oil loss, and the resources at risk are generally more extensive and difficult to protect than inland resources. Approximately 3,900 miles along the Pacific Coast and 1,600 miles in the Caribbean and Gulf of Mexico would be vulnerable to tanker spills. During the 40-year project life, tankers would experience about 6 spills greater than 10,000 barrels at 300,000 BPD throughput. This compares to 100,000 barrels lost from an anticipated 27 spills (averaging 3,750 barrels) on the All American Pipeline from California to the Gulf Coast. Oil lost in marine environments is often difficult to contain and clean-up. Emergency response teams generally consider inland spills much easier to deal with; terrestrial spills are normally smaller than tanker spills.

Conclusion. The Northern Alternative presents fewer problems than the other three alternatives. Its difficulties can be corrected to a greater degree.

Although the Northern Alternative would create impacts, its effects can in large measure be mitigated. Consider the following: an oil spill along the Proposed Route can still pose a significant risk to the Edwards Balcones Fault Zone Aquifer, despite an intensive mitigation program. The Southern Alternative would encounter severe construction problems which cannot be mitigated. The No Project Alternative would result in crude being shipped by older pipelines or inherently less safe tankers. The Northern Alternative's problems center on oil spills into rivers; with mitigation, these can be noticeably reduced. These advantages support BLM's conclusion that it is an acceptable alternative, and that it is BLM's preferred alternative.

2.0 CONSULTATION AND COORDINATION

2.0 CONSULTATION AND COORDINATION

2.1 Draft SEIS Review

In the course of preparation and review of the Draft and Final SEIS for the All American Pipeline, the lead agency (BLM) has communicated with and received input from many federal, state, and local agencies; elected representatives; environmental and citizens' groups; industries; and individuals. Many of these people participated in the public scoping meetings and subsequent public hearings that were held in cities in the vicinity of the pipeline routes. Scoping meetings were conducted in August 1986 in the following cities: Austin, Fredericksburg, Yoakum, San Antonio, Del Rio, Ozona, Brownwood, Temple, College Station, League City, and San Marcos.

The Draft SEIS was released for public review in January 1987. During the 60-day public comment period (January 31 through March 31), 12 formal public hearings were held to solicit comments on the Draft SEIS. These hearings were held in the following 11 cities: Austin, San Antonio, Yoakum, Fredericksburg, Del Rio, San Angelo, Brownwood, Waco, Brenham, Texas City, and San Marcos.

The public hearing transcripts have not been reprinted in this Final SEIS as they are part of the public record and are available for review at the following locations:

- Public Affairs Library
  L.B.J. School of Public Affairs
  University of Texas
  Austin, Texas

- Bureau of Land Management
  1695 Spruce Street
  Riverside, California

In addition, approximately 1,300 copies of the Draft SEIS were distributed by mail to various individuals, organizations, and government agencies.

Section 2.2 contains a summary of the hearing comments and BLM's responses. In addition to the public hearing comments, 123 written comment letters were received during the comment period. These comments and BLM's responses to them can be found in Section 2.3 of this SEIS. The following agencies, organizations, and industries have provided input to and/or received copies of the Draft SEIS.

Federal Agencies

Department of Agriculture
  U.S. Forest Service
  Soil Conservation Service

Federal Agencies (Continued)

Department of Defense
- Corps of Engineers
- Fort Hood Military Reservation

Department of Commerce
- National Marine Fisheries Services

Department of the Interior
- Bureau of Land Management
- Bureau of Reclamation
- Fish and Wildlife Service
- Geological Survey
- National Park Service

Department of Transportation
Environmental Protection Agency

State of Texas Agencies

Air Control Board
Agricultural Extension Service
Texas Antiquities Commission
Attorney General's Office
Board of Irrigators
Texas Commission on Fire Protection
Departments of:
- Agriculture
- Health
- Highways and Public Transportation
- General Land Office
- Parks and Wildlife

Economic Development Commission
Employment Commission
Fire Marshall's Office
Firemen and Fire Marshall Association for Volunteer Fire Departments
Forest Service
Historical Commission
Hotel/Motel Association
Natural Heritage Program
Natural Resources Division
Natural Resources Information Service
Office of the Texas State Archaeologist
Property Tax Board
Railroad Commission
Soil and Water Conservation Board
Southwest Texas State University, Edwards Aquifer Research and Data Center
State Board of Insurance
State Legislature: Ruben Garza, Legislative Assistant to Senator Barrientos
Texas A&I University
Texas A&M University
Texas Tourist Development Agency

State of Texas Agencies (Continued)

University of Texas at Austin
- Bureau of Business Resources
- Bureau of Economic Geology
- Dr. Clark Hubbs

Water Commission (formerly Department of Water Resources)
Water Development Board

Other State and Regional Agencies

Arizona Game and Fish Department
Blanco/Guadalupe River Authority
California State Lands Commission
Colorado River Municipal Water District
Council of Governments
- Alamo, Capitol Area, Concho Valley, and Upton Permian Basin

Edwards Underground Water District
Guadalupe River Authority
Lavaca - Navidad River Authority
Lower Colorado River Authority
Neuces River Authority
New Mexico State University
Santa Barbara County, Energy Division
Texas Volunteer Fire Departments

Brackettville	Mountain Home
Cat Springs	Ozona
El Campo	Seguin
Evant	Sheridan
McCamey	Yancey

Upper Guadalupe River Authority

Local Agencies

Fort Bend County Engineer
Galveston County Subsidence District
Harris County Engineer
Hays/Caldwell County Line Water Supply District
Travis County Attorney's Office

County - Judges

Atascosa; Judge O. B. Gates	Austin; Judge L. H. Grebe
Bastrop; Judge Griesenbeck	Bell; Judge J. Garth
Bexar; Judge Bickers	Blanco; Judge C. Scott
Brazoria; Judge E. E. Brewers	Brown; Judge G. L. Haney
Burleson; Judge W. A. Caperton	Caldwell; Judge W. J. Ellison
Coleman; Judge P. Skelton	Colorado; Judge L. J. Cranek
Concho; Judge C. J. Dankworth	Coryell; Judge D. Smith
Crockett; Judge Filds	DeWitt; Judge R. B. Sheppard
Edwards; Judge N. Smart, Jr.	Falls; Judge B. Kirkpatrick
Fayette; Judge D. R. Beck	Fort Bend; Judge J. Stadinoha
Galveston; Judge R. Holbrook	Gillespie; Judge M. Weiser
Hamilton; Judge B. Jankins	Harris; Judge J. Lindsay

County - Judges (Continued)

Hays; Judge D. Rains
Jackson; Judge S. D. Seale
Kimble; J. W. R. Dunk
Lavaca; Judge W. D. Roznovsky
McLennan; Judge S. Rentz
Milam; Judge G. F. Blake
Reagan; Judge F. Sandale
Tom Green; Judge E. G. Keyes
Val Verde; Judge Gonzales, Jr.
Wharton; Judge I. J. Irving
Upton; Judge P. Garner
Irion; Judge V. F. Lidley
Karnes; Judge E. Pearce
Kerr; Jud. G. S. Morris
Kinney; Judge A. A. Postell
Lee; Judge E. W. Kraus
Medina; Judge J. H. Decker
Mills; Judge T. W. Johnson
Sutton; Judge C. Fields
Uvalde; Judge J. R. White
Washington; Judge G. F. Mustcher
Wilson; Judge W. D. Cox

Cities

Austin Planning Department
Beaumont Highway Department
Houston Health Department
Texas City Surface Water Department

City Halls of:

Big Lake
Brackettville
Cuero
Devine
Floresville
Hitchcock
Jones Creek
Kyle
League City
McCamey
McGregor
Nassau Bay
Natalia
Needville
Ozona
Rankin
Rockdale
Rosenburg
Sealy
Sonora
Uvalde
Wallis
Webster

Organizations

Caesar Kleberg Wildlife Research Institute
Florida Sinkhole Research Institute (Karst terrain area); Orlando, Florida
John Gray Institute
Texas Speleological Society

Industries

Aquarena Springs Corporation; San Marcos, Texas
Bell Helicopter - Textron
Earth Resources Observation Systems (EROS) Data Center; Sioux Falls, South Dakota
Shell Oil Company; Austin, Texas
Telegraph Exploration, Inc.
Trinity Consultants; Richardson, Texas

2.2 Public Hearing Comments and Responses

The following section contains a summary of the comments and questions raised at the public hearings on the Draft SEIS for the All American Pipeline. Formal responses have been prepared for only those comments/questions that address the adequacy and/or accuracy of the Draft SEIS. However, all comments and opinions will be considered by the BLM in the final decision-making process.

March 2, 1987
Austin, TX
1:00 p.m.

1.	Lloyd Chriss Concurs with conclusions of SEIS.	1. Lloyd Chriss Your comment regarding the conclusions of the Draft SEIS is noted.
2.	Bill Aleshire Concerned about groundwater and surface water resources, particularly the Edwards Aquifer. Supports the Northern Alternative. Opposes any route that crosses the Edwards Aquifer.	2. Bill Aleshire Your comments regarding support for the Northern Alternative due to water resource concerns are noted.
3.	Paul Hilgers Pipeline is important to the state's economy. Pipeline must not pose a danger to the Edwards Aquifer. Supports the Northern Alternative.	3. Paul Hilgers Your comments regarding support for the Northern Alternative are noted.
4.	Dave Burkert SEIS does not consider alternatives other than routes. The option of not building the pipeline needs further consideration. More detailed study of undefined impacts needs to be done, e.g., acid rain, endangered species. What will be the impact to Attwater's greater prairie chicken?	4. Dave Burkert The No Project Alternative discusses alternatives other than different routes; please refer to Modifications and Corrections Section 3.3 for pages 2-37 and 4-172 for an expanded discussion of the No Project Alternative. Your comment regarding potential acid rain impacts from the Proposed Project is noted; please refer to the responses to written Comments 99-8 and 56-9. Also, regarding your concerns for potential impacts to the Attwater's greater prairie chicken, please refer to the response to written Comment 100-4 and Mitigation Measure TB-10 in Appendix A.
5.	Charles Woodruff, Jr. SEIS does not acknowledge that the area between Driftwood and Buda is a karstic limestone plain. Worst-case oil spill volume is only half the historic average for 30-inch diameter pipelines. Volume spilled is less than the amount between block and check valves. A worst-case analysis has not been conducted; larger spills have occurred in Texas (Kimble County, 25,000 barrels). Presents three alternate worst-case scenarios (will be followed up in writing). Threshold of detection of hydrocarbons in water supply presented in the EIS is too high (cites Freeze and Cherry). Additional inventory and analysis needs to be done in the Balcones fault zone of the Edwards Aquifer. Only 13.5 barrels of petroleum entering the eastern part of the aquifer (beneath Onion Creek) would exceed the threshold of taste.	5. Charles Woodruff, Jr. Please refer to the responses to Letter 64 regarding the issues raised in your oral testimony.

6. Lynn Storm

Supports avoiding the Edwards Aquifer. Feels that the worst-case oil spill scenario at Onion Creek is misleading by emphasizing the probability of once in 8,900 years.

7. George S. Hinkle

Believes the worst-case scenario at Onion Creek is not bad enough; should blow up the block valve or place the dynamite nearer the creek. Should look at a pipe/weld failure case. Critical path for oil spill activities (page B-16) needs to have two blocks added, one saying "spill not containable" and another saying "aquifer severely damaged."

8. Susan Rieff

Pleased with cooperation from Bill Haigh and Bill Sheffield. Will submit written comments following review of the Draft SEIS and Biological Assessment.

9. Charles Getter

Supports the Northern Alternative because it is furthest away from marine areas. Add a worst-case oil spill scenario for a spill into a coastal river, preferably along the Northern Alternative. Need to provide more detailed maps of river crossings in the Final SEIS so that a better assessment of effects can be made.

10. Senator Gonzalo Barrientos

Supports the Northern Alternative.

11. Lem Scarbrough

Written comments will be submitted at a later date.

12. Bert Gubbels

Concerned with the pipeline crossing marshlands in Fort Bend County and oil spill effects on rice growing and the Brazos River. Does not think the environment of Fort Bend County was studied in enough detail.

6. Lynn Storm

Your comment regarding your support for avoiding the Edwards Aquifer is noted. The Onion Creek to Edwards Aquifer Oil Spill Scenario has been revised; please refer to Appendix B of the Final SEIS.

7. George S. Hinkle

Thank you for commenting. Please refer to Appendix B of the Final SEIS for the revised Onion Creek to Edwards Aquifer Oil Spill Scenario. Please refer to the Modifications and Corrections section for pages B-1 through B-66 for revisions to the Oil Spill Contingency Plan.

8. Susan Rieff

Thank you for commenting.

9. Charles Getter

Your comment regarding support for the Northern Alternative is noted. More detailed maps of the proposed river crossings can be reviewed at the offices of the Texas Natural Heritage Program in Austin. Due to the large scale of these maps and the large number of river crossings, it was not practical to publish such maps with the Draft or Final SEIS. Please refer to the responses to Letter 104 regarding the specific issues raised in your oral testimony.

10. Senator Gonzalo Barrientos

Your comment regarding support for the Northern Alternative is noted.

11. Lem Scarbrough

Thank you for commenting.

12. Bert Gubbels

The BLM believes that the affected environment in Fort Bend County has been studied in sufficient detail to allow the analysis of potential impacts from the proposed pipeline.

12. (Continued)

Your comment regarding oil spill effects on marshlands and the Brazos River in Fort Bend County is noted. Information used to describe the aquatic resources in the Brazos River drainage was obtained from interviews with Texas Parks and Wildlife Department biologists, published literature, and a reconnaissance of major stream crossings. This data base was considered adequate to evaluate the impacts of the project.

Effects of oil spills on crop production and prime farmlands are discussed in sections of the Draft SEIS addressing soils and land use. Potential impacts would not be considered significant because they would be small in size (2.5 to 3.5 acres) and short in duration (less than 2 years). Cleanup of spills on land and subsequent reclamation of soils and productive capacity is typically very successful. See also Appendix B of the Draft SEIS for oil spill contingency plans.

13. Sally Shipman

Concerned with the Edwards Aquifer. Supports the Northern Alternative.

13. Sally Shipman

Your comment regarding support for the Northern Alternative is noted.

14. Linda Lewis Williams

SEIS does not adequately address potential damage to the Carrizo-Wilcox Aquifer. The effects of lignite mining on oil spill absorption is not discussed. The No Project Alternative is not developed as well as the other alternatives. The excess capacity of existing pipelines to the Gulf is not specified. Could the heavy crude refined in West Texas be lightened enough to be shipped without heating? How much electricity and natural gas would be saved by the No Project Alternative?

14. Linda Lewis Williams

Your comment regarding potential damage to the Carrizo-Wilcox Aquifer is noted; please refer to the response to written Comment 30-1.

Please refer to the Modifications and Corrections Section 3.3 for expanded discussions of the No Project Alternative and supply and demand of crude oil. Refining capacity for heavy crude does not exist in West Texas. Heavy crude could be lightened by blending with lighter crudes and thereby reducing the need for heating; however, owners of lighter crudes are expected to be very reluctant to blend their higher crude with lower grade crude. It must be remembered that as common carriers, the pipelines between West Texas and East Texas do not own the oil they transport. Assuming that a large amount of blending would not occur, additional heaters and pumping horsepower would have to be added to several existing pipelines to accommodate the volume of crude that would be transported by the All American Pipeline. The increased demand for electricity and natural gas of these retrofitted pipelines is expected to be greater than the demand of the All American Pipeline due to the smaller diameter of the pipelines and the lack of pipe insulation.

15. Debra Wahrmund

Concerned with oil spill impacts to the Carrizo-Wilcox Aquifer. SEIS did not adequately address Lee County, specifically: small municipal and private water suppliers, water quality on the East and Middle Yegua, prime farmland. Would like the pipeline constructed above ground or not at all.

16. George Humphrey

Concerned with the Edwards Aquifer. Supports the Northern Alternative. Does not believe safety features for the pipeline over the recharge zone are adequate. Believes the Edwards Aquifer should be given preferential treatment over other aquifers.

17. Earl Ingerson

Almost impossible to contaminate a whole aquifer by an oil spill. Felt there was a lack of information to back-up previous comments.

7:00 p.m.

18. Charles Siller

Supports the No Project Alternative as having the least impact on endangered species.

19. Michael P. Jansky

Preliminarily concludes that the Northern Alternative is the best choice of the alignment alternatives.

20. Marion Brooks

How will an oil spill entering a limestone bluff be contained? Will a fiber optic cable be used? Where will equipment sites be located? How will a spill be detected? How will I be notified in case of a spill? How will a spill be cleaned up?

15. Debra Wahrmund

Please refer to the response to written Comment 30-1 regarding your concerns for potential impacts to the Carrizo-Wilcox Aquifer and to Section 4.3.3 in the Draft SEIS for information on municipal surface water resources. Also, please refer to the response to Comment 12 above concerning effects of oil spills on crop production and prime farmland.

16. George Humphrey

Your comments regarding support for the Northern Alternative and concern for the Edwards Aquifer are noted. Please refer to pages 2-27 through 2-30 of the Draft SEIS concerning additional pipeline safety measures for the Edwards Aquifer.

17. Earl Ingerson

Your comments regarding oil spill contamination of aquifers are noted.

18. Charles Siller

Your comment regarding support for the No Project Alternative as minimizing impacts to endangered species is noted.

19. Michael P. Jansky

Your comment regarding support for the Northern Alternative is noted.

20. Marion Brooks

Please refer to the Oil Spill Contingency Plan in Appendix B of the Draft SEIS regarding your concerns on potential oil spills and subsequent emergency measures. Also, please refer to Mitigation Measure SS-6 in the Final SEIS concerning your question on communications and the use of fiber optics.

21. Barbara Dugelby

Acid deposition from refining high sulfur crude needs to be analyzed. Analysis of the effects of an oil spill on vegetation and wildlife is inadequate. How would an oil spill, particularly into limestone, be cleaned up? Doubts that the mitigation measures for oil spills presented in the Draft SEIS are adequate. Continued leaching of spilled oil in an aquifer or riparian area is not discussed. The effects of scour at the pipeline crossing below Stacy Dam is not discussed. Texans have not had an opportunity to comment on the project until it was three quarters complete. Questions the quality of welds on sections of the pipeline already in place. Wants to see a no action alternative that leaves the oil in the ground.

22. John Cece

Concerned about the quality of construction materials and fabrication procedures. Would like more information on pipe mills. Who will inspect pipe once it is delivered by the transporter? SEIS lacks definitive discussion on reduction of damage caused by third parties. The availability of the Texas One-Call System needs to be discussed. The adequacy of fire protection services to deal with pipeline fires needs to be determined. The adequacy of ambulance service needs to be discussed. Table 3-27 is misleading; confused about what is the nearest fire station to the Sonora and Sequin pump stations. Page B-40, a no action spill cleanup technique needs to be added.

23. Murray Walton

Supports the Northern Alternative. Mitigation measures for fish and wildlife do not include compensation for damages. Compliance/monitoring plans have not been developed. An Oil Spill Contingency Plan has not been developed. These plans should be subject to public review and comment.

21. Barbara Dugelby

Your comment regarding potential acid rain impacts is noted; please refer to responses to Comments 99-8 and 56-9.

Your comment concerning the adequacy of vegetation and wildlife oil spill effects is noted. Please refer to the Oil Spill Contingency Plan in Appendix B of the Draft SEIS regarding potential oil spill effects and cleanup measures.

BLM believes that there have been no out-of-the-ordinary quality problems with welds on sections of the pipeline already completed. In addition, BLM has no jurisdiction over the production of crude oil in California, Alaska, or Texas. As a common carrier, AAPL would have no control over the production of crude oil. Therefore, a No Project Alternative that involves not producing oil is not applicable to this SEIS.

22. John Cece

Please refer to the Modifications and Corrections section for page 4-8 and Figure 4-1a regarding quality control procedures.

AAPL will subscribe to the Texas One-Call system. Please refer to the responses to written Comments 72-14, 79-15, and 79-17 and the Oil Spill Contingency Plan in Appendix B of the Draft SEIS regarding your concerns with emergency response and fire protection in the event of an oil spill. Also, refer to Modifications and Corrections Section 3.3 for pages 2-37 and 4-172 concerning the No Project Alternative.

23. Murray Walton

Your support for the Northern Alternative has been noted. Please refer to Mitigation Measure TB-1 for compensation on potential impacts to fish and wildlife species.

The BLM Authorized Officer will be responsible for compliance with the stipulations of the SEIS. AAPL is not required to submit an Oil Spill Contingency Plan until six months prior to operation. Please refer to the response to written Comment 18-3 and Mitigation Measure SS-1 in Appendix A of the Final SEIS.

24. George Avery

Supports the no pipeline alternative because of the probability (99 percent, re: page A-14) of an oil spill over an aquifer.

24. George Avery

Your comment regarding support of the No Project Alternative is noted.

March 3, 1987
San Antonio, TX

1. Weir Labatt, III

Supports the Northern Alternative; opposes the Proposed Route and Southern Alternative.

1. Weir Labatt, III

Your comment regarding support for the Northern Alternative is noted.

2. George K. Hickox

AAPL's compliance with pipeline industry standards is not addressed. An analysis of the proposed design and construction plans should be conducted. Feels it is misleading to infer that Celeron and Goodyear conceived and designed the pipeline. The economic viability of the project and its effect on design and construction quality needs to be addressed. Believes All American has used inferior engineering and design practices.

2. George K. Hickox

Please refer to the responses to Letter 67 regarding the issues raised in your oral testimony.

3. Ralph Cooper

Concerned with protecting the water supply of San Antonio. Feels $10 million insurance for the pipeline is inadequate. Feels the threat to groundwater is small and does not justify selecting the Northern Alternative. Recommends that an Oil Spill Contingency Plan be developed, personnel trained to the plan, and a field exercise conducted each year. Suggests staging personnel and equipment to allow a 30-minute response time to the location of any spill. Recommends grouting of recharge features along the pipeline, contouring to direct an oil spill away from a recharge feature, keeping ROW clean of brush, and maintaining ROW access routes.

3. Ralph Cooper

Please refer to the responses to Letter 18 regarding the issues raised in your oral testimony.

4. John Kothmann

Does not believe that the analysis justifies selecting the Northern Route as the preferred alternative. Cites the greater length and greater human activity as reasons against the Northern Route. Has there ever been significant damage to an aquifer due to a spill from a pipeline? How can 77 barrels of oil pollute the entire Edwards Aquifer? Does the unlikely event of an oil spill warrant $50 to $60 million added cost; does the SEIS make this conclusion? States that the SEIS is in error because additional variables make the likelihood of a spill much less than once in 8,900 years.

4. John Kothmann

Please refer to the responses to Letter 20 regarding the issues raised in your oral testimony.

5. Joan West

Concerned with oil contamination of the Edwards Aquifer. Supports the Northern Alternative.

6. Burt McAshan

Indicates that 125-spills per year would occur in the Edwards Aquifer in 1990. What is the overall spill rate? Supports the Northern Alternative. Is foreign pipe to be used and how would it be tested? How much hydrocarbon does it take to make water undrinkable?

7. Walt Wilder

Supports the Northern Alternative. Concerned about welding problems.

8. Tom Culbertson

Believes the pipeline is being opposed without all the facts.

9. Sally Buchanan

Concerned with oil spills into the Edwards Aquifer.

March 4, 1987
Yoakum, Texas

1. No speakers.

5. Joan West

Your comment regarding support for the Northern Alternative due to possible oil contamination of the Edwards Aquifer is noted. Please refer to the response to written Comment 1-1.

6. Burt McAshan

Your comment regarding support for the Northern Alternative is noted. Foreign-made pipe would be used and it would be tested according to AAPL specifications as contained in their Quality Assurance Plan; please refer to page 2-12 in the Draft SEIS. Also, please refer to the response to Comment 6-4 concerning drinking water standards and to Section 4.2.1 in the Draft SEIS on estimated spill rates and volumes.

7. Walt Wilder

Your comment regarding support for the Northern Alternative is noted. Weld inspection is described in Section 2.2.2.5 (page 2-22) of the Draft SEIS and would be conducted by AAPL according to U.S. Department of Transportation regulations.

8. Tom Culbertson

Your comment regarding opposition to the pipeline is noted.

9. Sally Buchanan

Your comment regarding oil spills into the Edwards Aquifer is noted.

March 5, 1987
Fredericksburg, Texas

1. H. Yellin

SEIS does not adequately describe oil spill control at pump stations; site-specific spill prevention, control, and containment plans should be prepared. Standby power should be provided at headquarters, pump stations, and remote block valves to run the communications systems. Given the potential loss of revenue, would AAPL shut the pipeline down if a small leak is indicated by the leak detection system? Oil spills at pump stations and terminal facilities are not addressed. Heater-caused fires and fire control at pump stations are not addressed. The fire department table is very misleading. Thinks an extruded coating should be used for the entire system. Wants all block valves to be remote-control.

2. Roy W. Hann

Supports the Northern Alternative. Need site-specific contingency plans for the 15 largest stream crossings and subsurface spills. Should specifically document manpower, equipment, and supply resources. Should prepare a detailed response manual for spills up to 20,000 barrels. Feels 3,400 barrels is too small for contingency planning. Should install a control system, alarm, and shutdown test facility. Liability insurance for third-party damages should be carried for the entire pipeline.

3. Hazelle Calcote

Opposes the pipeline crossing Texas for safety reasons. Supports requiring liability insurance.

4. Martin Werner

SEIS is deficient in discussion of health effects of oil hydrocarbons contaminating water supplies. SEIS does not compare potential groundwater impacts for the alternative routes. No justification is given for routing the pipeline across the Edwards Aquifer. Further discussion is needed of special construction techniques for crossing sensitive areas. No rationale is given for using manual block valves at river crossings. Discussion of potential oil spill effects on private wells is not adequate. Discussion of the effects of soluble fractions of oil on surface water or groundwater is not adequate. SEIS is inconsistent on construction techniques to be used near the Caverns of Sonora. ROW restoration techniques for the Texas Hill Country need to be more specific.

1. H. Yellin

Please refer to the responses to Letter 69 concerning the issues raised in your oral testimony, particularly regarding procedures for pump stations. AAPL's stated policy is to close down the line upon the detection and location of a leak. Please refer to the response to written Comment 78-8.

Please refer to the responses to written Comments 72-14, 79-15, and 79-17 and the Oil Spill Contingency Plan in Appendix B of the Draft SEIS regarding your concerns with emergency response and fire protection in the event of an oil spill.

In response to your comment concerning remote-controlled block valves, please refer to the response to written Comment 79-15.

2. Roy W. Hann

Please refer to the responses to Letter 22 regarding the issues raised in your oral testimony.

3. Hazelle Calcote

Your comments regarding opposition to the pipeline and support for liability insurance are noted.

4. Martin Werner

Please refer to the responses to Letter 78 regarding the issues raised in your oral testimony.

5. Judge Jay Weinheimer

SEIS is incorrect (page 3-2) in that the City of Fredericksburg's water supply wells are located less than 0.5 mile from the Proposed Route. SEIS is incorrect (page 4-31) in that there is a direct connection between the Hensel Sand Aquifer and the Ellenberger Aquifer. Feels that there is a much greater hazard to Gillespie County from an oil spill than presented in the SEIS. Supports the Northern Alternative.

5. Judge Jay Weinheimer

Please refer to the responses to Letter 21 regarding the issues raised in your oral testimony.

6. Peter R. Rose

Feels the Edwards Aquifer in the Edwards Plateau region has been ignored. This area should be given the same construction and engineering safety measures as the Balcones fault zone. Draft SEIS fails to consider oil spill impacts on the water supply (source South Llano River) of Junction, Texas. Worst-case oil spill scenario in the Balcones fault zone is not worst-case. Worst-case scenario for the Edwards Plateau region has not been prepared. Frequency and volume of future oil spills from the project are significantly underestimated. Predictions should be based on the historical record. Likelihood of polluting the Edwards Aquifer is much higher than the Draft SEIS indicates. Social and economic consequences of a major oil spill are not discussed. How long will it take to clean up wells and water supplies? Where will replacement water come from? How will a spill affect agriculture, recreation, and property values? Who will pay for damages? Supports the Northern Alternative.

6. Peter R. Rose

Please refer to the responses to Letter 66 regarding the issues raised in your oral testimony.

7. E. L. Danos

How many pipelines cross the Edwards Aquifer today?

7. E. L. Danos

Data in Rose (1986) show six existing crude oil pipelines across the Edwards Aquifer.

8. W. J. Alexander

Feels that percolation tests should have been done.

8. W. J. Alexander

Your comment regarding the need for percolation tests is noted.

9. H. A. Baldwin

Opposes the Southern Alternative.

9. H. A. Baldwin

Your comment regarding opposition to the Southern Alternative is noted.

10. Burt McAshan

Opposes the Central Route. SEIS does not discuss air pollutant testing at pump stations, placing ethyl mercaptin in the oil to aid in leak detection, and the effects of sulfur dioxide and hydrogen sulfide on steel pipe. Supports the Northern Alternative.

10. Burt McAshan

Your comments regarding opposition to the Proposed Route and support for the Northern Alternative are noted.

The pump/heater stations stack emissions will be limited to pollutants associated with the natural gas combustion of the heater furnaces. These emissions are well documented in EPA references and manufacturer specifications. If the TACB requires AAPL to conduct emissions testing of these sources as a stipulation of the TACB operating permits, then these tests will be conducted according to EPA standard test protocol and will be approved by the TACB in advance of the tests.

11. Van C. Brown

Opposes the Central Route.

11. Van C. Brown

Your comment regarding opposition to the Proposed Route is noted.

March 9, 1987
Del Rio, Texas

1. Lee Weathersbee

Concerned with Del Rio's drinking water supply. Opposed to the Southern Alternative.

1. Lee Weathersbee

Your comment regarding opposition to the Southern Alternative due to concern for Del Rio's water supply is noted.

2. Rosemary W. Jones

Believes groundwater should be considered before anything is done to affect it.

2. Rosemary W. Jones

Your comment regarding concern for groundwater is noted.

3. Nick Fohn

Where the Southern Alternative crosses metropolitan areas (Uvalde and Yoakum), SEIS needs to address utility easements.

3. Nick Fohn

As with any existing prior ownership or use right to land in the path of the pipeline, prior rights of existing utility easement owners would have to be accommodated in the ROW negotiations. Consequently, it is reasonable to assume that there would be no significant adverse effects on existing utility lines and easement rights.

4. Dan Burr

What were the factors used to arrive at the preferred route?

4. Dan Burr

Please refer to pages 2-40 through 2-46 in the Draft SEIS for a discussion of the selection of the BLM Preferred Alternative.

March 10, 1987
San Angelo, Texas

1. Lloyd Tankersly

Supports the analysis of groundwater and surface water contained in the SEIS.

1. Lloyd Tankersly

Your comment regarding the groundwater and surface water analysis is noted.

2. Judge James D. Westfall

Supports the All American Pipeline.

2. Judge James D. Westfall

Your comment regarding support for the All American Pipeline is noted.

3. Marcus Gilstrap

Concerned with oil spill impacts on water supply.

3. Marcus Gilstrap

Your comment regarding concern for oil spill impacts on water supply is noted.

4. Ralph Hoelscher

Concerned with salty hydrogen sulfide water contaminating surface water and groundwater near Christoval. Concerned with oil spills affecting Twin Buttes, Nasworthy, and Stacy Reservoirs, and underground water supplies. States it would take 1.4 barrels of oil to contaminate Lake Nasworthy, 21.6 barrels to contaminate Twin Buttes, and 64.6 barrels to contaminate Stacy Lake. Opposes the Northern Alternative. Recommends independent inspection of pipe, no blasting during construction, closer spacing of block valves, spill response crews on duty at all times, hydrocarbon sensors at frequent intervals, and reporting of abandoned wells encountered during construction.

4. Ralph Hoelscher

Please refer to the responses to Letter 6 regarding issues raised in your oral testimony.

5. Richard Crisp

Supports the pipeline project. Concerned with protecting drinking water. Has four requirements for the pipeline: 1) it must be built with proper materials and construction techniques, 2) each live stream crossing must have automatic pressure sensors and block valves, 3) pressure sensors and cathodic protection must be properly maintained, and 4) emergency crews must be stationed in the area.

5. Richard Crisp

Please refer to the responses to Letter 29 regarding issues raised in your oral testimony.

6. Ruth McGill

Concerned with oil spill effects on drinking water supply. Feels the pipeline should be moved to minimize stream crossings.

6. Dr. Ruth McGill

Your comments regarding the potential effects of an oil spill on drinking water supply and minimizing the number of stream crossings are noted. All American would implement minor realignments in the route to minimize the number of stream crossings.

7. Louis J. Blanek, Jr.

Concerned with blasting effects on wells, i.e., increased salt levels. Would like the pipeline moved farther north.

7. Louis J. Blanek, Jr.

Your comment regarding moving the pipeline further north is noted. Please refer to the response to written Comment 6-2 regarding the effects of blasting.

March 11, 1987
Brownwood, Texas

1. Bob Lilly

Opposes Northern Alternative. Feels construction and maintenance would disturb wildlife and livestock. Concerned about oil spills.

1. Bob Lilly

Your comments regarding opposition to the Northern Alternative and concern for wildlife, livestock, and oil spills are noted.

2. C. T. McClatchy, Jr.

Concerned with contamination of his water supply from an oil spill and with impacts to wildlife.

2. C. T. McClatchy, Jr.

Your comments regarding concern for water supply and wildlife are noted. Please refer to the responses to Letter 74.

3. Clarence O. Ford

Feels that the crude oil pipeline crossing water lines and telephone lines should be considered.

3. Clarence O. Ford

Crossing other pipelines, including oil, gas, refined product, water, and telephone, is described in Section 2.2.2.11.1 (page 2-27) of the Draft SEIS. The All American Pipeline would be placed beneath all existing pipelines with much of the excavation done by hand.

4. Corinne Smith

Concerned about contamination of the Edwards Aquifer.

4. Corinne Smith

Your comment regarding concern for contamination of the Edwards Aquifer is noted; please refer to the response to written Comment 1-1.

5. Jack Carroll

Feels that the entire pipeline route should be surveyed for archaeological resources prior to construction. Effects on vegetation, wildlife, and aesthetics should be considered. Topsoil should be segregated, respread following construction, and reseeded.

5. Jack Carroll

A cultural resources survey of the selected route will be conducted prior to construction. Effects on terrestrial ecology and visual resources have been addressed; please refer to Chapter 4 of the Draft SEIS. Mitigation Measure S-1 in Appendix A of the Final SEIS addresses restoration.

March 12, 1987
Waco, Texas

1. Tina Strmiska

Concerned that noise and odors from the pipeline and pump stations would affect greyhound farm, and about oil contamination of the Wilcox Aquifer. Seismic events in northwest Milam County need to be studied. The computer model used to evaluate noise impacts cannot account for the sensitivity of greyhounds. Wildlife information for Milam County (page E-2-35) is inadequate; many species are not listed. Why is the Edwards Aquifer more important than any other aquifer (i.e., special protection measures)? Why was the Northern Alternative not ranked last, based on safety?

2. Larry W. Strmiska

Concerned about the effects of the pipeline on his business. Will the pump stations pump sulfuric gas out of the oil and release it into the air?

3. Roger Edens

Supports the pipeline project for economic reasons.

4. Cornelius Titsworth

The effects of noise and odors on sensitive animals needs to be studied. Objects to the Northern Alternative and pump station number five. Air quality impacts of the pipeline have not been adequately evaluated, refers to volatile organics and sulfur oxides along the Gulf Coast. Supports the No Action Alternative.

5. Monica Marek

Opposes the Northern Alternative and pump station number five on the Wilcox Aquifer. Concerned with oil spills affecting water supply wells.

1. Tina Strmiska

Please refer to the responses to Letter 44 regarding the issues raised in your oral testimony.

2. Larry W. Strmiska

Your concern regarding potential sulfuric gas emissions from the pipeline crude oil at the pump/heater stations is unwarranted. The primary emissions associated with the pump/heater stations are the result of natural gas combustion only. The crude oil and associated gas products are sealed in the pipeline and are not vented to the atmosphere during the pumping and heating process.

3. Roger Edens

Your comment regarding support for the pipeline project for economic reasons is noted.

4. Cornelius Titsworth

Please refer to the responses to Letter 45 regarding the issues raised in your oral testimony.

5. Monica Marek

Your comments regarding opposition to the Northern Alternative and pump station number five due to oil spill effects on wells are noted. Please refer to the responses to Letter 41 regarding issues raised in your oral testimony.

6. H. P. Tumlinson

Concerned with the effects of the pipeline on his ranch and wildlife.

7. Milton J. Schiller

Concerned with an oil spill affecting the City of Cameron's water supply, which comes from the Little River; pipeline construction affecting the city's future landfill site; and shallow water supply wells for rural homes. These concerns need to be considered in the SEIS.

8. John A. Sefcik

Opposes the Northern Alternative because of the danger of oil pollution to the Wilcox Aquifer. SEIS has not proven a need for the pipeline. Supports the No Project Alternative.

9. Hugh W. Davis

Currently reviewing the SEIS.

10. Edwin Marek

How deep will the pipeline be buried? Will it cut through the water table (about 10 feet below the ground)?

March 13, 1987
Brenham, Texas

1. Jack Matson

Supports the Northern Alternative. Concerned about contamination of the Edwards Aquifer from an oil spill. Benzene was never directly addressed. Worse "worst-case" scenarios can be hypothesized and should be analyzed. In the Edwards Aquifer

6. H. P. Tumlinson

Your comment regarding effects on ranching and wildlife is noted. Please refer to the responses to Letter 71 regarding the issues raised in your oral testimony.

7. Milton J. Schiller

Your comment regarding a potential land use conflict between the Northern Alternative and the City of Cameron's future landfill site is noted. Development of the pipeline across the site would conflict with future use of the site for a landfill because of added costs to seal the landfill cell(s) around the pipeline under state regulations. Such conflicts would be resolved through negotiations between AAPL and the City at the time of ROW acquisition at which time the City's rights and interests in the property would have to be accommodated.

Please refer to the responses to Letter 40 regarding potential impacts to groundwater supplies.

8. John A. Sefcik

Your comment regarding opposition to the Northern Alternative due to potential oil pollution of the Wilcox Aquifer is noted. Please refer to the responses to Letter 30 regarding the issues raised in your oral testimony.

9. Hugh W. Davis

Thank you for commenting.

10. Edwin Marek

The pipeline will be buried 36 inches below ground level in areas of soil and 20 inches in areas of solid rock.

1. Jack Matson

Please refer to the responses to Letter 46 regarding issues raised in your oral testimony.

recharge zone, spilled oil may move by two-phase flow rather than one-phase flow. SEIS does not address the long-term impacts of a major spill on water supplies. Oil degradation products were not considered. The conclusion on significant risk to the aquifer does not agree with the analysis.

2. Brandt Mannchen

Piecemeal development of the project eliminates a true No Action Alternative. No Action Alternative in the SEIS was not analyzed to an equivalent level of detail. Analysis of retrofitting refineries in California is inadequate. The energy conservation alternative has not been examined. Ozone pollution on the Gulf Coast has not been discussed. Heavy metals, total suspended particulates, and toxic organic compounds are not discussed in sufficient detail. Primary and secondary air pollution should be discussed.

3. Jim V. Rouse

Steambed scouring is not well addressed in the SEIS. Prefers the Northern Alternative. No discussion in the SEIS of the shingling effect, of 100-year storm events, or of geologic conditions at stream crossings. The latter two were presented in the SEIS for the western portion. SEIS passes over scouring in rock bed streams. Worst-case spill would occur during a dry period when the crude would adhere to the rocks.

4. Leroy Grebe

Does not oppose the pipeline.

5. Robert Utter

Just attending hearing.

6. Cecil R. Froebel

Opposed to pipeline crossing his land.

2. Brandt Mannchen

Please refer to the Modifications and Corrections section for an expanded discussion of the No Project Alternative and crude oil Supply and Demand. The No Project Alternative (i.e., not building the pipeline) is still valid for the McCamey to Gulf Coast segment analyzed in this SEIS. Retrofitting refineries is discussed under Supply and Demand.

Please refer to responses to Comments 56-9, 56-122, and 72-33 regarding your air quality concerns.

3. Jim V. Rouse

Please refer to the responses to Letter 47 regarding the issues raised in your oral testimony.

4. Leroy Grebe

Thank you for commenting.

5. Robert Utter

Thank you for commenting.

6. Cecil R. Froebel

Your comment regarding opposition to the pipeline is noted.

7. Albert J. Blaha

Opposes the Northern Alternative. Why is the BLM involved in Texas? Prefers the Southern Alternative.

7. Albert J. Blaha

Your comment regarding opposition to the Northern Alternative and support for the Southern Alternative is noted. The BLM was the federal lead agency for the preparation of the original All American Pipeline EIS from California to west Texas; therefore, this supplemental EIS covering the pipeline segment from McCamey to the Gulf Coast is also being prepared by BLM.

8. John Wayne Martin

Concerned about oil company dealings with landowners.

8. John Wayne Martin

Your comment regarding oil company relations with landowners is noted.

9. Margie K. Stolz

Size, location, and impacts of the pump/heater station near Cat Spring have not been presented. Would like more specific information on the pipeline route.

9. Margie K. Stolz

Detailed maps of the pump/heater station locations and pipeline routes were used for impact analysis. As shown on Figure 2-2 in the Draft SEIS, the pump stations would be approximately 400 feet by 600 feet. The location of Station No. 6 is shown on Map 2-3, Sheet 8. And impacts of the station are discussed for various disciplines in Section 4.3; long-term operational noise has been identified as a significant impact associated with the pump station near Cat Springs. More specific information on the location of any pipeline facilities in relation to an individuals property can be obtained from AAPL.

10. Gene LeFleur

Supports the pipeline.

10. Gene LeFleur

Your comment regarding support for the pipeline is noted.

11. Lew W. Harpold

Does not feel he was given adequate notice of the public hearing.

11. Lew W. Harpold

Your comment regarding notification of the public hearings is noted.

12. Barry Klein

Would like to see a cost-benefit study done for the project.

12. Barry Klein

Cost-benefit studies are not required by CEQ guidelines and are, thus, beyond the scope of this SEIS.

13. Beth Campbell

Opposes the Northern Alternative. Did not receive adequate notice of the hearing. Will the pipeline reduce the price of Texas oil?

13. Beth Campbell

Your comment regarding opposition to the Northern Alternative is noted. BLM made an extensive effort to notify people in the project area of the public hearings. Notices were sent to all people who received a copy of the Draft SEIS, and news releases were sent to local newspapers and radio and television stations along the proposed and alternative pipeline routes.

Texas crude oil is a different type than the California crude oil that is expected to be transported in the All American Pipeline. Therefore, the price of Texas crude is not expected to be affected by the pipeline.

March 16, 1987
Texas City, Texas

1. Eugene Myska

Opposed to the pipeline crossing his land. Prefers the Northern Alternative.

1. Eugene Myska

Your comment regarding support for the Northern Alternative is noted.

2. C. E. Myska

Opposed to the pipeline crossing his land. Prefers the No Project Alternative.

2. C. E. Myska

Your comment regarding support for the No Project Alternative is noted. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172 for additional information on the No Project Alternative.

3. Kevin J. Foto

Feels the economic impacts to farmers and ranchers will be major. SEIS should have included the route from the Texas border to McCamey. The purpose and need section should be updated to reflect the current oil economy. Would like more detail on oil spill containment and cleanup techniques. The worst-case scenario should be done for a 30-inch pipeline and not a 12-inch pipeline. Supports the No Project Alternative. Would like more time to review the SEIS.

3. Kevin J. Foto

Your comments regarding economic impacts to farmers and ranchers and support for the No Project Alternative are noted. The segment of pipeline from the Texas border to McCamey was analyzed as part of the original All American Pipeline EIS. Please refer to the Modifications and Corrections section for an expanded discussion of crude oil supply and demand and an expanded Oil Spill Contingency Plan. Additional information on the Oil Spill Contingency Plan is included in the Modifications and Corrections Section for pages B-1 and B-66. The analysis for the catastrophic scenario in the Draft SEIS was conducted for a 30-inch pipeline. Assumption on page C-7 of Appendix C regarding pipeline diameter contains a typographical error. Analysis for a new catastrophic spill scenario has been conducted and is included in Appendix B of the Final SEIS. All assumptions used for this analysis are presented. The BLM received your written comments and has responded to them in this document (see Letter 94). Therefore, we have assumed an extension of the review period was not necessary.

4. Albert Blaha

Opposes the Northern Alternative and the pipeline crossing his property.

5. Leonard W. Penkert

Decrease in property values has not been considered.

March 17, 1987
San Marcos, Texas

1. J. E. Younger

Opposes the Proposed Route. The number of people who derive their water from the Edwards Aquifer is not considered.

2. Don Rains

Opposed to the pipeline.

3. Anne Cooper

Supports the Northern Alternative.

4. C. Dale Zinn

Does not have enough detail to assess the reasonableness of the worst-case scenario. How were the release amounts calculated? What hole size in the pipe was assumed? The calculations for release rate and total spill were not clearly identified. There are no estimates of how many individuals' water supply could be affected by a spill or for how long. Are such estimates possible? The chance of an oil spill should be estimated and the information used to make the estimate clearly identified. Does not like connection factors labeled as "assumed". SEIS does not discuss fire, explosion, or H_2S hazards. Was a full diameter rupture considered; is it reasonable to consider?

5. W. S. Decker

Agrees with the study and the proposals. Cannot detect certain kinds of leaks by air patrol.

4. Albert Blaha

Your comment regarding opposition to the Northern Alternative is noted.

5. Leonard W. Penkert

A significant decrease in property values is not anticipated. Other than minor restrictions on use of the easement (i.e., no buildings and no large trees), the existing land uses are not expected to change.

1. J. E. Younger

Your opposition to the Proposed Route is noted. The use of the Edwards Aquifer as an important water supply was considered in the impact assessment.

2. Don Rains

Your comment regarding opposition to the pipeline is noted.

3. Anne Cooper

Your comment regarding support for the Northern Alternative is noted.

4. C. Dale Zinn

Please refer to the responses to Letter 63 regarding the issues raised in your oral testimony.

5. W. S. Decker

Your comments regarding agreement with the Draft SEIS and concern about leak detection are noted.

6. Joseph K. Longacre

Supports the Northern Alternative. SEIS does not provide specific information on permeability, porosity, and hydrologic gradients in the major and minor aquifers. The movement of spilled crude oil entering the subsurface at Onion Creek should be discussed. Crude oil entering the aquifer would not mix evenly but would move as a plume. Toxic, water-soluble constituents of crude oil should be discussed. Maximum discharge of the Pedernales River can be as high as 65,000 cfs rather than the 13,000 cfs given in the SEIS.

7. J. M. Nance

Supports the Northern Alternative; feels the central route is unacceptable. Concerned with oil spill contamination of the Edwards Aquifer. Feels the estimate of eight breaks over the life of the pipeline is too low.

8. Tom Van Zandt

An "apples to apples" comparison of alternatives has not been made. More field level data should be collected, particularly on groundwater. More substantiation of the worst-case analysis should be provided.

9. Clifton Ladd

Would like discussion for all three alternatives combined under affected environment and environmental consequences. The Texas Organization for Endangered Species and Texas Natural Heritage Program lists were not discussed.

The Texas Parks and Wildlife Department changes to the State list of threatened or endangered species were not included. The explanation for selection of alternative routes for analysis is inadequate. Appendix E does not discuss vegetation along the routes. There are no mitigative measures to protect aquifer ecosystems. There is no discription of impacts on the Edwards Aquifer ecosystem.

6. Joseph K. Longacre

Your support for the Northern Alternative is noted. Please refer to the responses to Letter 65 regarding the issues raised in your oral testimony.

7. J. M. Nance

Your support for the Northern Alternative is noted. Please refer to the responses to Letter 50 regarding the issues raised in your oral testimony.

8. Tom Van Zandt

Your comment regarding comparison of alternatives is noted; please refer to the responses to Letter 52 regarding the issues raised in your oral testimony.

BLM believes that sufficient data was collected to allow the analysis of impacts and the comparison of alternatives.

A new catastrophic spill scenario has been analyzed and the results are presented in Appendix B. The assumptions used in this analysis are described in detail.

9. Clifton Ladd

Your comment regarding SEIS organization is noted; please refer to the responses to Letter 52 regarding the specific issues raised in your oral testimony.

10. R. G. Phillips

Opposes the proposed pipeline. Supports the Northern Alternative.

10. R. G. Phillips

Your comments regarding opposition to the proposed pipeline and support for the Northern Alternative are noted.

11. Lynn Storm

Thanked panel for holding hearings.

11. Lynn Storm

Thank you for commenting.

12. Chuck Misenheimer

Opposed to the pipeline crossing the Edwards Aquifer.

12. Chuck Misenheimer

Your comment regarding opposition to the pipeline crossing the Edwards Aquifer is noted.

13. David Davelgott

Concerned with pollution of the San Marcos River.

13. David Davelgott

Your comment regarding concern for pollution of the San Marcos River is noted. The Proposed Route does not cross any flowing tributaries to the San Marcos River. Therefore, the likelihood of an oil spill impact to the San Marcos is extremely remote.

14. Jay Moore

SEIS does not address impact on tourist economy during construction. Feels groundwater contamination is likely.

14. Jay Moore

Please refer to the responses to Letter 53 regarding the issues raised in your oral testimony.

15. Sharon Michaelis

Everything written in the SEIS is supposition because the final design has not been completed. The pipeline leak detection system needs to be described in more detail. The Kyle High School is only several hundred feet from the pipeline and could be exposed to a fire. How can impacts to life and property be judged minimal if final design has not been completed.

15. Sharon Michaelis

Please refer to the response to Comment 86-38.

BLM believes that sufficient detail on project design was available to allow the analysis of impacts resulting from the proposed pipeline. Final design is typically not completed until an applicant has received approval for a project. For this reason, Mitigation Measure SS-3 (see Appendix A) was developed to ensure that a safe project having minimal impact on life and property will be constructed and operated. Further detail on the pipeline leak detection system is presented in the Modifications and Corrections section of the Final SEIS.

Please refer to the response to Comment 86-26 regarding the proximity of Kyle High School to the Proposed Route.

16. Eileen Conley Opposed to the Proposed Route; supports the Northern Alternative.	16. Eileen Conley Your comment regarding opposition to the Proposed Route and support for the Northern Alternative is noted.
17. Charles Hill Metal fatigue caused by different pressures and temperatures should be considered.	17. Charles Hill The All American Pipeline, as a common carrier, will be constructed to accommodate crude oil under various temperature and pressure conditions. The specifications for the pipe exceed the requirements of API Standard 5L, as shown in Table 4-1 of the Modifications and Corrections section of the Final SEIS.

2.3 Written Comments Received and Responses

The BLM received 123 letters addressing the Draft SEIS during the public comment period. All letters received were reviewed. Substantive comments (those that presented new data, questions, or issues bearing directly on the effects of the proposed All American Pipeline and Alternatives) were responded to, and where appropriate, Draft SEIS sections were revised. Table 2-1 lists each comment letter and identifies its assigned reference number. Individual substantive comments within each letter were identified and responded to. The responses, which accompany each letter, are keyed to the appropriate comment by the reference numbers that appear on the comment letter.

All comment letters have been reprinted verbatum, and all substantive comments have been addressed in this Final SEIS. Letters that did not address environmental issues but presented an opinion were acknowledged.

TABLE 2-1

COMMENT LETTERS

Letter Number	Source of Letter
1	Judge James E. Sagebiel, Alamo Area Council of Governments
2	S. A. Lowrance
3	Councilman Weir Labatt, City of San Antonio
4	Roland A. Lozano, City of San Antonio
5	Roger Duncan, Texans for Aquifer Protection
6	Ralph E. Hoelscher
7	Dolly Lambdin
8	Charles J. Schell
9	Charles Siller, Austin Regional Group, Sierra Club
10	Murray T. Walton, National Audubon Society
11	Lem Scarbrough, Jr.
12	George Humphrey, City of Austin
13	Richard and Cherial Metheney
14	Karen A. Haschke, League of Women Voters of the Austin Area
15	Sally Shipman, City of Austin
16	Lynn Storm
17	Judge Bill Aleshire, Travis County
18	Dr. Ralph Cooper, Cooper Associates
19	Joan West
20	John H. Kothmann
21	Judge Jay Weinheimer, Gillespie County
22	Roy W. Hann, Jr.
23	Shirley Pape
24	Harry F. Wilke
25	E. L. Danos
26	Paul A. Davis
27	William J. Alexander
28	Ed H. Naberhaus, Bexar County
29	Richard Crisp, City of San Angelo
30	John A. Sefeix
31	Judge James D. Westfall et al., Irion County
32	Boone E. Kemp
33	Earl Ingerson
34	Jan Suche
35	Mrs. R. W. Kothmann
36	Mrs. Lena Kothmann
37	H. J. Sattler
38	Bob Burleson
39	Richard Crisp, City of San Angelo
40	Mayor Milton J. Schiller, City of Cameron
41	Dennis and Monica Marek
42	Clem Tomek
43	Mr. and Mrs. Edwin F. Marek
44	Tina Titsworth Strmiska

TABLE 2-1 (CONTINUED)

Letter Number	Source of Letter
45	Cornelius Titsworth
46	Jack V. Matson
47	Jim V. Rouse, AWARE
48	W. S. Decker
49	Calvin C. Otte
50	J. M. and Eleanor Nance
51	State Representative Anne Cooper, Dist. 47
52	Tom Van Zandt et al., Espey, Huston & Assoc., Inc.
53	J. Lloyd Moore, Aquarena Springs Corp.
54	Elgin Pape
55	Diane Pape
56	Brandt Mannchen, Lone Star Chapter, Sierra Club
57	J. C. Towers
58	Mrs. Viola Sevcik
59	Thomas P. Fox, Edwards Underground Water Dist.
60	Thomas R. Baumli, International Boundary and Water Comm.
61	Hazelle Cabote
62	Sally Frederick
63	C. Dale Zinn, Energy Analysts Inc.
64	Charles Woodruff, Jr.
65	Joseph K. Longacre, William F. Guyton Assoc., Inc.
66	Peter R. Rose, Ph.D., Telegraph Exploration, Inc.
67	George K. Hickox, P.E.
68	William W. Thompson, III, Texas Water Commission
69	H. Yellin, International Pipeline Assoc.
70	Barney L. Knight, City of Austin
71	H. P. Tumlinson and Brothers, T-Bar Ranch
72	F. Hermann Rudenberg, Lone Star Chapter, Sierra Club
73	Mary McAnulty
74	C. T. and LaVerne McClatchy
75	Thomas F. King, Advisory Council on Historic Preservation
76	Wendy Silverman, Alamo Chapter, Sierra Club
77	Joe C. Efedermith
78	Martin D. Werner, Ph.D.
79	John M. Cece, Ph.D.
80	R. C. McMahan, Shell Pipe Line Corp.
81	Dave Ryan, Tom Green County
82	Linda Lewis Williams
83	J. W. Hershey
84	Mary M. Burk, Tom Green County
85	Tom Syfan, Three Mill Ranch
86	Sharon Michaelis
87	Ruth G. McGill, M.D.
88	Hardy Turnbo
89	George DeWolf
90	Tip Van Court

TABLE 2-1 (CONTINUED)

Letter Number	Source of Letter
91	E. W. Jones
92	Harold Pettitt
93	C. L. McMillan
94	Kevin J. Foto and Michelle C. Stright-Foto
95	C. M. Hoffman, All American Pipeline Co.
96	Steve Spaw, P.E., Texas Air Control Board
97	Mrs. Leo Miller
98	Darrell G. Warner, Exxon Pipeline Co.
99	National Park Service
100	H. Dale Hall, U.S. Fish and Wildlife Service
101	Garry Mauro, Texas General Land Office
102	M. S. Huckle and Emmett M. Burchett
103	James F. Devine, U.S. Geological Survey
104	Charles D. Getter, Ph.D., Technology Management Group, Inc.
105	J. W. Hershey
106	Barry G. Rought, P.E., U.S. Army Corps of Engineers
107	William Cochran, U.S. Bureau of Mines
108	LaVerne Herrington, Texas Historical Commission
109	David M. Cochran, P.E., Texas Department of Health
110	Robert E. Layton, Jr., P.E., U.S. Environmental Protection Agency
111	Margaret Kollatschny Stolz
112	Charles D. Travis, Texas Parks and Wildlife Department
113	Wray & Todd Interests, Ltd.
114	Ruth G. McGill, M.D.
115	Darrell Creel, Ph.D.
116	Ralph E. Hoelscher
117	Ruth G. McGill, M.D. et al.
118	J. A. Jaquier
119	Richard D. Funk
120	M. J. Aiken
121	Lewis Runion
122	Ruth G. McGill, M.D.
123	Andrew L. Williams, Jr. P.E.

LETTER 1

RESOLUTION

WHEREAS, The Alamo Area Council of Governments has a long history of support for, and appreciation of, the need for the preservation of the Edwards Underground Aquifer as the solo source for drinking water in San Antonio, and

WHEREAS, The All American Pipeline Company, Inc. has proposed to construct a pipeline from California to Texas via routes that could result in the pipeline traversing the Edwards Underground Aquifer, and

1-1 WHEREAS, No really feasible means exist to insure complete guarantee against leaks from said pipeline, and

WHEREAS, Said traversing of the Aquifer could result in potential pollution of the Aquifer to the severe detriment of all persons utilizing water from the Aquifer.

1-2 NOW THEREFORE BE IT RESOLVED, The Alamo Area Council of Governments, at its regular meeting on this 18th day of February 1987, does unanimously go on record to support the preferred route that the United States Bureau of Land Management preliminary environmental report would site said pipeline away from the Edwards Underground Aquifer.

FURTHERMORE RESOLVES, on behalf of its 92 local governments and more than 1.3 million persons in the AACOG Region, that all elected and appointed representatives do their utmost to stop any effort that in any way would pollute, or threaten to pollute, the Edwards Underground Aquifer, and thereby would oppose the routes that would cross the Edwards Recharge Zone as non-acceptable environmentally.

Witness my hand this 18th day of February, 1987

James E. Sagebiel

Judge James E. Sagebiel
Chairman, AACOG Executive Committee

Al J. Notzon, III
Executive Director, AACOG

RESPONSE TO LETTER 1

1-1 Your comment regarding guarantee against leaks is noted. Please refer to pages 2-27 through 2-30 of the Draft SEIS describing the special design features proposed for the Edwards Balcones Fault Zone Aquifer, which reduce the probability of a spill in the 6.4 mile recharge area to 1 in about 700 years. Please also refer to the mitigation measures for system safety (SS-1 through SS-10) and groundwater (GW-1 through GW-3) in Appendix A.

The Edwards Balcones Fault Zone Aquifer was discussed in depth in the Draft SEIS in Section 3.2.2.1.3, pages 3-8 through 3-13 and in Section 4.2.2.3.3, pages 4-31 through 4-33. The Edwards Balcones Fault Zone Aquifer is governed by complex hydrogeologic processes, and that it is extremely difficult to predict the behavior of an oil spill in such an aquifer. Further discussion along these lines is provided in Appendix A, Section 1.3 in the Modifications and Corrections section of the Final SEIS.

The geology of this aquifer ranges from tight Manley limestones, in which flow is more similar to that of pourous media, to highly fractured, vugular and cavernous limestone, in which flow is primarily governed by local solution channel characteristics. Flow in the fractured media, on a very local scale, may actually go against the regional groundwater gradient.

The Proposed Route of the AAPL would cross the Balcones Fault Zone in the area which primarily recharges the Austin subarea of the aquifer. However, the route would lie 0.25 mile to the north of the groundwater divide which separates the Austin subarea from the San Antonio subarea of the aquifer. While an oil spill in this vicinity would most probably move toward the Austin subarea and Barton Springs (20 miles north of the route) the possibility of movement toward the San Antonio sub-basin (a sole-source aquifer) and San Marcos Springs (7 miles south of the route) cannot be ruled out. Sensitive receptors closer to the route including wells supplying the cities of Buda, Kyle, Hays, Manchaca, Sunset Valley, and privately owned water supply wells in the area also have the potential to be affected by an oil spill. Depending on the flow conditions, any of these areas could be downgradient of the pipeline.

Depth to groundwater in these areas ranges from approximately 650 to 525 ft below ground surface. Given the extreme vertical and lateral variations in the lithology and structure of the limestone, it is difficult to predict how readily spilled crude would penetrate any given stretch of the recharge zone. Highly fractured, cavernous areas would be more extensively affected than tight, massive areas.

The threshold spill size for polluting an aquifer and associated health effects are discussed in the Modifications and Corrections section for Appendix A, Sections 1.4 and 1.5. In addition, a catastrophic oil spill of 3,230 barrels occuring in the highly prolific Onion Creek portion of the Edwards Recharge Zone, illustrates one case (given many assumptions) in which an oil spill might affect the Edwards Balcones Fault Zone based on health effects and taste and odor threshold criteria (see Appendix B of the Final SEIS).

1-2 Your comment regarding support for the Northern Alternative and the desires of the Austin Area Council of Government (AACOG) is noted.

LETTER 2

S. A. Lowrance
P. O. BOX 215
YOAKUM, TEXAS 77995

FEB 19 11:57

Mr. William Haigh
Bureau of Land Management.

Dear Sir:

I would like to make this statement in regard to the location of the All American Pipeline in our area, namely Lavaca County, Texas.

I own approximately 1700 acres of land in the lower part of the County, in the John J. May Survey and the B. Riley and Margaret Carroll Surveys, two seperate tracts.

I have a total of six pipelines on these tracts of land, three on each tract, rangeing from three inches to some 20 or 30 inches. some have been there for years and I have never had a single problem with any of them. They maintain the right-o-ways very nicely including erosion.

2-1 I feel that it would be good for the local economy and I as a land owner would welcome it. Most individuals that object do not have any experience with pipe lines, having none on their land. I can see no damage to the community by another pipeline as there is a network of pipe lines in this area now and there is no damage or bad effects suffered from them.

Yours Truly

S. A. Lowrance

RESPONSE TO LETTER 2

2-1 Your comment regarding support of the proposed All American Pipeline is noted. Thank you for commenting.

LETTER 3

01-01-01

CITY OF SAN ANTONIO
Office of the City Council
Interdepartment Correspondence Sheet

AGENDA ITEM NO. 42

TO: Mayor and Council

FROM: Councilman Weir Labatt - District 9

COPIES TO: File

SUBJECT: EDWARDS AQUIFER

Date February 19, 1987

I am asking that the City Council take an official position concernin the proposed pipeline over the Edwards Aquifer. Pursuant to a court order a study has been prepared and is being presented to the citizenry at a series of public hearings.

The study presents three (3) acceptable routes. Two (2) routes go over the Edwards Aquifer. The third route goes north of the Edwards Aquifer.

2-32

3-1 I have great concern that a pipeline over the Edwards Aquifer will possibly endanger the quality of the sole source of water to the City of San Antonio. Therefore, I am requesting that the City Council pas a resolution that:

1. states that the two (2) routes over the Edwards Aquifer are not acceptable;
2. states support for the route to the north of the Edwards Aquifer.

Weir Labatt

WEIR LABATT, Councilman
District 9

Mayor Henry Cisneros		Walter Martinez	
Maria A. Berriozabal	MAB	Bob Thompson	yes D. Deissaos
Joe Webb	JWebb	Yolanda Vera	
Helen Dutmer	OK.	G.E. Harrington	
Frank Wing		James Hasslocher	

RESPONSE TO LETTER 3

3-1 Your comment regarding the Edwards Aquifer and support for the Northern Alternative is noted.

LETTER 4

CITY OF SAN ANTONIO

50-01-01

Interdepartment Correspondence Sheet

AGENDA ITEM NO. 42

TO: City Council through City Manager

FROM: Roland A. Lozano, Director, Department of Planning

COPIES TO: S. Marcus Jahns, Assistant City Manager; Frank Kiolbassa, Director, Environmental Management; Rebecca Quintanilla Cedillo, Assistant Director, Planning; File

SUBJECT: RESOLUTION -- ALL-AMERICAN OIL PIPELINE COMPANY

Date February 25, 1987

SUMMARY AND RECOMMENDATION

In 1985, The All-American Oil Pipeline Company applied for permission to construct a hydrocarbon transmission line across the Edwards Aquifer recharge zone. A federal court order mandated that an environmental impact statement (EIS) be prepared. The EIS proposed three routes one of which traverses north of the aquifer towards Waco.

This resolution expresses the City of San Antonio's concern for aquifer protection and preference for the northern route with application of stringent construction safeguards.

BACKGROUND

4-1 The Bureau of Land Management of the Department of the Interior prepared the EIS as mandated by federal court order. The Bureau of Land Management prefers the northern route and the All-American Oil Pipeline Company concurs.

CONCLUSION

This resolution supports the northern route and reiterates the City's priority of aquifer protection.

Rebecca Quintanilla Cedillo
for Roland A. Lozano
Director, Department of Planning

RAL/bjs

APPROVED:

Louis J. Fox
City Manager

RESPONSE TO LETTER 4

4-1 Your comment regarding support for the Northern Alternative for the All American Pipeline is noted. Thank you for commenting.

LETTER 5

Texans for Aquifer Protection

Christina Little, Treasurer
6705 Danwood Dr.
Austin, Tx. 78759

February 25, 1987

Mr. William Haigh
U.S. Bureau of Land Management
1695 Spruce
Riverside, California 92507

Dear Mr. Haigh:

5-1 I speak for Texans for Aquifer Protection Political Action Committee which supports creation of an underground water district to protect the Edwards Aquifer associated with Barton Springs. The aquifer provides a significant percentage of water to Austin residents and is the sole source of water for many small cities and rural residents in Travis and Hays Counties.

Therefore, I am in opposition to the proposed route by All-American Pipeline Company through this area of central Texas and support the conclusions of the Draft Supplemental Environmental Impact Statement prepared by the Bureau of Land Management for the alternative northern route.

Thank you.

Yours truly,

Roger Duncan
Chairman

RESPONSE TO LETTER 5

5-1 Your comment regarding support for the Northern Alternative for the All American Pipeline is noted. Thank you for commenting.

LETTER 6

March 1, 1987

Bureau of Land Management
P. O. Box 1449
Sante Fe, New Mexico 87504

To the preparers of the Environmental Impact Statement on the All American Pipeline:

As a concerned citizen and landowner in Tom Green County, Texas, I am submitting the enclosed comments which could be included in the Environmental Impact Statement you are preparing concerning the All American Pipeline.

Sincerely,

Ralph E. Hoelscher

Ralph E. Hoelscher
Route 2 Box 50
Miles, Texas 76861
Ph: 915 468-2592

RESPONSE TO LETTER 6

LETTER 6

The All-American Pipeline has been completed from near Santa Barbara, California, across Arizona, New Mexico, and Texas to McCamey. The original intent of this company was to tie into existing pipelines from McCamey to Houston refineries. The Celeron Company now plans to bury a 30 inch diameter, heated, crude-oil pipeline projected to carry over 400,000 barrels per day (300 barrels per minute - 12,000 gallons per minute) with a pumping pressure of 1,000 pounds per square inch across our area of Texas. The company stated that electronic leak-pressure monitors and line block valves would be installed at 18 mile intervals. Perhaps the main reason the oil is being shipped to Texas for refining is because it has such a high sulfur content that it would violate California environmental laws to refine it there. 6-1

The pipeline route originally was planned to cross the Edwards Aquifer in Central Texas, but complaintants were able to persuade the Bureau of Land Management to give tentative approval to the northern route which will now pass south of San Angelo. A very serious problem prevails in attempting to lay this pipeline across an area near Christoval. Any blasting of this rock formation will fracture the formation and allow salty, hydrogen sulfide water to surface and enter into surface and underground water supplies. (Documented through TRC reports.) 6-2

Pipeline leakage is another issue which needs attention. Based on historical pipeline performance, crude-oil spills from a 30-inch pipeline can be expected to occur about every two years. A major oil spill from a line of this size could exceed 75,000 barrels. (Documented in Dr. Peter Rose report.) The pipeline would cross the water shed of the Twin-Buttes, Nashworthy, and Stacy Reservoirs which supply water to San Angelo and other cities in West Texas. Possible contamination of underground water supplies in Tom Green and surrounding counties must also be taken into consideration. 6-3

Agricultural crops, rangeland, trees, etc. would also be affected by oil pipeline leakage. Bacterial oxidation could in time consume much of the oil spilled on the land surface which is not reclaimed during clean-up operations and the oil company could compensate for the immediate agricultural crop losses, however, the most serious effects of pipeline leakage would occur when the oil hydrocarbons enter surface water reservoirs and seep into our underground water supplies.

Water hydrologists have formulated that one-third of the hydrocarbons in one barrel of oil will be dissolved in water and the remaining two-thirds will float. The soluable hydrocarbons from one barrel of oil would be absorbed by 280,000 gallons of water to its average maximum absorbency rate of 50 parts per million. Humans can taste and smell dissolved hydrocarbons in water at only five parts per billion; therefore, the taste and odor threshold will be 50,000 times higher than the total absorbency rate of 50 parts per million. We can now see that this same one barrel of oil could contaminate 14 billion gallons or 43,000 acre feet of water. (Reference: Groundwater, Freeze/Cherry, 1979). The portion of hydrocarbons that is dissolved in the water cannot be cleaned up or removed. 6-4

RESPONSE TO LETTER 6

6-1 Based on the current refining capabilities and current air quality permits of California refineries, all of the heavy California crude cannot be refined in California. In the Gulf Coast refineries, 300,000 to 400,000 BPD of heavy crude can be accommodated by the refineries within their current air quality permits by substituting California heavy crude for foreign crude.

The Los Angeles area refineries can refine about 169,000 BPD of crude oil without retrofits within their current air quality permits (Murray 1986). The high sulfur content of the crude is one of the key factors limiting refining capacity. The refining capacity will vary based on the specific oils and respective sulfur contents; low sulfur crudes offset high sulfur crudes and thus, 169,000 BPD is an approximate value. The Los Angeles area refiners have a slate of crude oils that meets market needs, is within the technical capabilities of the refineries, and is within the legally permitted emissions rates. The slate includes a variety of California crudes, Alaska North Slope crude, and some limited imported crude.

PADD 5 has an excess production of about 700,000 BPD and this excess will be shipped to the Gulf Coast refineries by one means or another. Please see the Modifications and Corrections section for page 3-107.

6-2 It is possible to perform shallow surface blasting without inducing catastrophic fracturing of underlying formations. An analysis of the structural geology in the area of concern will be made and blasting plans will be modified, as necessary, to ensure that fracturing of the formation does not occur. Please refer to Mitigation Measure G-5 in Appendix A.

Experience in blasting has shown no structural damage occurs when peak particle velocities are maintained at less than 2 inches per second. Design of a blast sequence to accomplish this is dependent on several factors: type of explosive used and properties of the rock, charge size, and distance. An implication of charge size is delayed or sequential blasting, wherein multiple shots are fired with millisecond delays, thereby reducing the instantaneous propagation intensity for a given blast pattern.

Where it is determined, mathematically or through field application, that particle velocities below 2 inches per second cannot be achieved in the proximity of a water well, mechanical ripping of the strata could be used in lieu of blasting.

Also please see the response to Comment 66-37.

Mitigation Measure GW-3 addresses the mitigation of groundwater resources adversely affected by pipeline construction.

6-3 The procedures used by the Draft SEIS preparers to estimate the frequency of occurrence of oil spills is provided in the Modifications and Corrections section for page 4-10. Spill frequency estimates are based on both historical spill rates and an evaluation of engineering design and operating practices. Please refer to Tables 4-9, 4-39, and 4-50 of the Draft SEIS for estimates of volumes lost from a catastrophic oil spill. Some of these volumes approach the 75,000 barrels estimate stated by the comment.

Please refer to the response to Comments 6-24, 29-2, and 39-1 for the impacts to Twin Buttes, Nasworthy, and Stacy Reservoirs.

LETTER 6

6-5 Illustration: One barrel of oil would be more than enough to contaminate 12,000 acre foot Lake Nashworthy, less than five barrels of oil could contaminate 186,000 acre foot Twin-Buttes Reservoir, and only thirteen barrels of oil could contaminate the proposed 554,000 acre foot Stacy Lake. Consider then what could happen in the event of the catastropic effects of an average 6,000 barrel oil leak or even worse a maximum 75,000 barrel oil leak.

6-6 Even with flow-pressure sensors which have a detection accuracy of 1/10 of 1%, possible small ghost leaks of 200 barrels of oil per day could escape detection and slowly contaminate our underground water.

6-7 In order to avoid serious problems, I am proposing that this pipeline not be built across this area of Texas. Perhaps a refinery could be built at McCamey or the crude oil could be transported through existing lines. Otherwise I suggest that

6-8 the All American Pipeline take the less populated southern route across the lower part of Texas. If the northern route

6-9 is taken, then strict guideline must be drawn to protect surface and underground water from contamination. I propose the following construction guidelines: 1) All pipes should be inspected by a private firm to pressure test the tubing and to inspect all

6-10 welds. 2) No explosive blasting of rock formations to install the pipeline. Problems have arisen in the past by blasting the San Angelo rock formation which resulted in the breaking of plugs in old abandoned oil wells which allowed salt water flows

6-11 to intermingle into fresh water supplies. 3) Line block-valves must be placed at closer intervals to decrease the maximum oil

6-12 leakage. 4) Spill response crews on duty at all times.

6-13 5) Pressure valves and hydrocarbon sensors be installed at frequent intervals. 6) Abandoned wells (oil or water) encountered

6-14 during pipeline construction be reported immediately to the Texas Railroad Commission to verify proper plugging.

6-15 A federal suit filed in Midland by the All-American Pipeline Company resulted in a restraining order preventing the Texas Railroad Commission and Travis and Hays County officials from taking any action that would prevent construction of the pipeline. I would hope that this type of action will not be taken against the county officials in this area. This federal restraining order should be removed before pipeline construction proceeds because the Texas Railroad Commission is the state policeing agency of the oil and gas industry in Texas and therefore should require environmental guidelines for pipeline construction, witness and inspect pipeline construction, periodically pressure test the integrity of the pipeline during operation, and enforce clean-up operations in the event of pipeline leakage.

This testimony is respectfully submitted by:

Ralph E. Hoelscher

Ralph E. Hoelscher
Route 2 Box 50
Miles, Texas 76861
Ph: 915 468-2592

RESPONSE TO LETTER 6

Using the criteria described in Section 3.2.2 of the Draft SEIS to identify sensitive aquifers, the Edwards-Trinity Plateau Aquifer has been identified as a sensitive aquifer in Tom Green County, with general groundwater movement from northwest to southeast, and overlain by Quaternary Alluvium. Please refer to the Modifications and Corrections section for page 3-8 for detailed hydrogeologic characteristics of this area. Also refer to the revisions to Appendix A (Sections 1.1 and 1.3) in Modifications and Corrections Section 3.3. These sections describe crude oil properties and behavior, specifically in Edwards and associated limestone.

6-4 Your concern for surface water contamination is noted. The response to your concerns is in two parts. One part is a description of actual observances by Emergency Response Teams relative to surface water contamination; this topic is addressed in the response to Comment 22-3. The second part deals with a theoretical spill, liabilities, and possible levels of contamination.

The following is a theoretical evaluation of crude oil dispersal and potential health effects in a freshwater system.

It is assumed that an average size oil spill occurs and 2,700 barrels of crude oil leak directly into the South Concho River in one hour. The South Concho River is flowing at 33.4 cfs which is the average annual flow. The river flows at that rate for one hour, a total of 120,240 ft^3 of water. The 2,700 barrels of oil is diluted by the 120,240 ft^3 of water. EPA Region 8 (Jones 1987) uses the following breakdown for a crude oil spill in fresh water: 15 percent volatilizes, 10 percent goes into solution, and 75 percent floats, of which 40 to 50 percent is recovered. The remaining 35 to 25 percent is lost on vegetation, debris, and sediment.

The following is a calculation to determine the concentration of soluble oil and constituents in water.

2,700 barrels of crude oil spilled into the river,
10 percent or 270 barrels go into solution.

270 barrels = 11,340 gals
$= 4.3 \times 10^7$ cm^3
Assume °API Gravity = 38.91,
Specific Gravity = 0.83, and
Density (P_o) = 0.83 gm/cm^3,
then $(4.3 \times 10^7\ cm^3) \times (0.83\ gm/cm^3)$
$= 3.6 \times 10^7$ gm
$= 3.6 \times 10^{10}$ mg

Volume in the South Concho River
120,240 $ft^3 = 3.4 \times 10^6$ l

Concentration of oil in solution in the water

$$\frac{3.6 \times 10^{10}\ mg}{3.4 \times 10^6\ l} = 10{,}600\ l$$

The South Concho River flows into Twin Buttes Reservoir, 4 miles downstream of the pipeline crossing. Twin Buttes Reservoir has an average volume of 20,000 AF; which equals 8.7×10^8 ft^3 which equals 2.5×10^{10} l. The concentration of soluble oil in Twin Buttes Reservoir is:

$$\frac{3.6 \times 10^{10}\ mg}{2.5 \times 10^{10}\ l} = 1.4\ mg/l$$

RESPONSE TO LETTER 6

As shown in Table 1, crude oil typically contains trace amounts of several toxic or hazardous compounds. These trace constituents include volatile organics, polyaromatic hydrocarbons (PAHs), and metals. Table 1 includes the solubility limit (in water) and the octanol-water partition coefficient as well as typical concentrations of each hazardous constituent in crude oil.

The octanol-water partition coefficient is equal to the concentration of a substance in octanol divided by the concentration of the substance in water when the octanol and water solutions are in equilibrium with each other. The high partition coefficients of the volatile organics and especially of the PAHs reflect the hydrophobic nature of these compounds. Hazardous constituents will diffuse from separate crude oil phases into the water. However, concentrations in the water will be limited due to the large octanol-water partition coefficients of the organic compounds. For instance, if the crude oil contains 1,000 mg/l benzene, then water in equilibrium with the crude oil will contain approximately 10 mg/l benzene. This relationship is not exact since crude oil is a mixture of several hydrocarbons rather than just octanol, but the nonpolar nature of the hydrocarbons will tend to keep the organic compounds in solution in the crude rather than in the water. The hydrophobic nature of the organic constituents will result in maximum surface water concentrations significantly below solubility limits.

TABLE 1
Hazardous Constituents of Crude Oil

Compound	Solubility in Water (mg/l)	K_{ow}	Typical Concentration in Crude Oil (mg/l)
benzene	1750	100	330-3400
toluene	535	500	750-20400
ethylbenzene	152	1400	660-2600
xylene (total)	198	890	2700-27000
phenanthrene	1.0	29000	
fluoranthene	0.206	340000	
pyrene	0.132	200000	
benzo(a)anthracene	0.0057	400000	
chrysene	0.0018	400000	0.5-40
benzo(b)fluoranthene	0.014	4000000	
benzo(k)fluoranthene	0.0043	7000000	
benzo(a)pyrene	0.0012	1000000	
benzo(g,h,i)perylene	0.0007	10000000	
antimony			0.1-0.3
cadmium			1.0-2.5
nickel			3.0-120
copper			0.2-12.0
lead			0.001-0.2
mercury			0.03-0.1

K_{ow} = octanol-water partition coefficient (concentration of chemical in octanol divided by concentration of chemical in water, at equilibrium)

from W.A. Gruse and D.R. Stevens, "Chemical Technology of Petroleum," McGraw-Hill, New York 1960.

K. van Nes and H.A. van Westen, "Aspects of the Constitution of Mineral Oils," Elsevier, Amsterdam, 1951.

EPA, Superfund Public Health Evaluation Manual, Office of Emergency and Remedial Response, Washington D.C., October 1986.

RESPONSE TO LETTER 6

The four constituents with the lowest octanol-water partition coefficient (K_{ow}) will have the largest concentration in water. It was assumed that the crude oil had a mid-value of the typical concentration in crude oil, benzene 2,000 mg/l, toluene 10,000 mg/l, ethyl benzene 1,500 mg/l, and xylene 15,000 mg/l. As discussed earlier, the equilibrium solubility is the concentration divided by the K_{ow}. The equilibrium solubility for benzene, toluene, ethyl benzene, and xylene are 20, 20, 1, and 17 mg/l, respectively.

One barrel of oil is equal to 1.32×10^8 mg. Based on the equilibrium solubility concentrations the soluble fraction of benzene, toluene, ethyl benzene, and xylene represent the following percentages in 1 barrel of oil; 0.000015 percent, 0.000015 percent, 0.0000008 percent, and 0.000013 percent, respectively.

The following is a calculation to determine the concentration of benzene, toluene, ethyl benzene, and xylene in Twin Buttes Reservoir.

Benzene

3.6×10^{10} mg total soluble, of which 0.000015 percent is benzene

$(3.6 \times 10^{10}\ \text{mg}) \times 0.00000015) = 5.4 \times 10^3$ mg

2.5×10^{10} l of water in Twin Buttes Reservoir

$$\frac{5.4 \times 10^3\ \text{mg}}{2.5 \times 10^{10}\ \text{l}} = 2.2 \times 10^{-7}\ \text{mg/l}$$

Toluene

3.6×10^{10} mg total soluble of which 0.000015 percent is toluene

$3.6 \times 10^{10}\ \text{mg} \times 0.00000015 = 5.4 \times 10^3$ mg

$$\frac{5.4 \times 10^3\ \text{mg}}{2.5 \times 10^{10}\ \text{l}} = 2.2 \times 10^{-7}\ \text{mg/l}$$

Ethyl benzene

3.6×10^{10} mg total soluble of which 0.0000008 percent is ethyl benzene.

$(3.6 \times 10^{10}\ \text{mg}) \times (0.000000008) = 2.9 \times 10^2$ mg

$$\frac{2.9 \times 10^2\ \text{mg}}{2.5 \times 10^{10}\ \text{l}} = 1.2 \times 10^{-8}\ \text{mg/l}$$

Xylene

3.6×10^{10} mg total soluble of which 0.000013 percent is xylene.

$(3.6 \times 10^{10}\ \text{mg}) \times (0.00000013) = 4.7 \times 10^4$ mg

$$\frac{4.7 \times 10^4\ \text{mg}}{2.5 \times 10^{10}\ \text{l}} = 1.9 \times 10^{-6}\ \text{mg/l}$$

The following is what can be expected in Twin Buttes Reservoir from an average spill:

Benzene	2.2×10^{-7} mg/l
Toluene	2.2×10^{-7} mg/l
Ethyl benzene	1.2×10^{-8} mg/l
Xylene	1.9×10^{-6} mg/l

Table 2 presents the applicable drinking water standards for the four constituents.

TABLE 2

Applicable Water Quality Standards and Criteria
(all concentrations in mg/l)

Compound	Drinking Water Standards RMCL[a]	MCL[b]	SNARL[c] Acute	Chronic	Ambient Water Quality Criteria for Protection of Human Health (Ingesting Water and Organisms) Toxicity	Carcinogencity[d]
benzene	0	0.005[e]		c[f]		
toluene	2.0[e]		420	0.34	14.3	6.6×10^{-4}
ethyl benzene	0.68[e]				1.4	
xylene (total)			12	0.62		

a RMCL = Recommended Maximum Contaminant Level
b MCL = Maximum Contaminant Level
c SNARL = Suggested No Adverse Response Level
d For incremental increased lifetime cancer risk of 10^{-6}
e Proposed Value

Table 2 indicates that the benzene concentration exceeds the Recommended Maximum Contaminant Level but is below the Maximum Contaminant Level. The other constituents do not exceed the applicable water quality standards.

As stated, it was assumed an average spill size of 2,700 barrels leaked into the South Concho River and Twin Buttes Reservoir. If remote-control valves are installed at the crossing, the spill volume would be 2,500 barrels.

Cleanup details can be found in the Oil Spill Contingency Plan, Appendix B of the Draft SEIS.

Humans can taste and smell dissolved hydrocarbon products in water at 5 µg/l. However, the taste and odor threshold for crude oil is 0.1 to 0.5 mg/l (Iveson and Packham 1967).

6-5 The volumes listed in this comment are incorrect due to an erroneous taste and odor value. Please refer to the response to Comment 6-4.

6-6 Please refer to the Modifications and Corrections section for page 4-6 for information on the issue of chronic low-volume spills.

6-7 Your support of the No Project Alternative for the All American Pipeline is noted. If a refinery were built in McCamey or Midland, multiple product carriers would be required to ship the petroleum products to market. It is safer and more economical to refine crude oil where most of it is to be used rather than to ship refined products. A break in a product pipeline is much more dangerous in terms of fire, explosion, and toxicity. Please refer to the Modificiations and Corrections section for pages 2-37 and 4-172 regarding the No Project Alternative.

6-8 Your comment regarding preference of the Southern Alternative for the All American Pipeline across the lower part of Texas is noted. Thank you for commenting.

RESPONSE TO LETTER 6

6-9 The pipeline will be inspected during construction by qualified personnel from both the BLM, Pipeline Project Office and DOT, Office of Pipeline Safety.

6-10 Thorough records searches will be performed to identify known locations of abandoned oil wells in the vicinity of the proposed pipeline ROW (see Mitigation Measure GW-1 in Appendix A). Where it is deemed necessary, blasts will be designed to mitigate potential adverse effects on abandoned and inactive wells as well as functional wells. In some cases, it may be prudent to curtail blasting in the immediate vicinity of a given well or wells, and in those cases, mechanical trenching will be utilized. Please see Mitigation Measure G-5 in Appendix A.

6-11 The preliminary design review of block valve spacing conducted in the Draft SEIS indicates it is acceptable. Some additional block and check valves have been required by Mitigation Measure SS-2 (see Appendix A) at sensitive receptor locations. Oil volumes in the event of a spill are best mitigated by requiring remote-control block valves, and these have also been included by Mitigation Measure SS-2 where response times by the Emergency Response Team are not adequate.

6-12 Trained spill response crews are on-call at all times. These crews are composed of pipeline operational and management personnel with immediate assistance provided by outside contractors. All discrete actions (i.e., response through final cleanup) of an oil spill become their primary concern and duty when called.

6-13 Pressure sensors are included in the pipeline design proposed by AAPL. Hydrocarbon sensors were considered as a possible mitigation measure but were rejected because of concern over their reliability over the extended 40-year project life.

6-14 Your comment regarding abandoned oil or water wells is noted; please refer to revised Mitigation Measures G-1 and GW-3 in Appendix A. Please also refer to the response to Comment 6-10.

6-15 The federal court agreement was arrived at between the State of Texas, BLM, and AAPL. In this court agreement, AAPL agreed not to construct its pipeline east of McCamey until an SEIS was prepared by the BLM. AAPL agreed to abide by all the mitigation measures and other conclusions recommended by the BLM in the Final SEIS. The Attorney General for the State of Texas agreed to appoint a coordinator of all the state agencies and to review and facilitate the preparation of various technical sections of the SEIS.

Thirty days after the BLM files a Record of Decision, the project (if approved) will proceed under the supervision of BLM. The BLM Authorized Officer will oversee compliance by AAPL to engineering and environmental stipulations; the State of Texas will assist upon request.

DOT and TRRC will assume their normal responsibilities associated with an interstate common carrier crude oil pipeline.

Although the proposed All American Pipeline is an interstate common carrier, the following statutes and rules outline key activities of the TRRC applicable to the All American Pipeline.

RESPONSE TO LETTER 6

Texas Natural Resources Code, §91.101, which provides the TRRC authority to regulate crude oil pipelines for the purpose of preventing the pollution of surface or subsurface water in the State of Texas:

> §91.101. Rules and Orders
>
> To prevent pollution of surface water or subsurface water in the state, the commission shall adopt and enforce rules and orders and may issue permits relating to the production of oil and gas and handling of incidental wastes resulting from oil and gas production. These activities are associated with the storage, handling, reclamation, gathering, transportation, or distribution of oil or gas prior to the refining of such oil or prior to the use of such gas in any manufacturing process or as a residential or industrial fuel.

The TRRC Statewide Rule 8 (16 TAC §3.8) provides protection for water resources, with emphasis on pollution control, disposal methods, and disposal permitting. Statewide Rule 20 (16 TAC §3.20) concerns notification of fire, breaks, leaks, or blow outs for crude oil, gas, geothermal resource, and other well liquids. Statewide Rule 70 (16 TAC §3.65) handles pipeline permitting within the State, outlining applicable regulations.

The State of Texas Oil and Hazardous Substances Spill Contingency Plan, produced by TWC, designates TRRC responsibilities regarding notification requirements, spill response, cleanup activities, and material disposal.

In the event of a spill involving crude oil from an offshore rig or platform operating in coastal waters or a crude oil pipeline or a truck spill on an oil and gas lease, notification of the appropriate TRRC field office is necessary in lieu of calling the Texas Emergency Response Center. TRRC will determine if containment and cleanup is adequate for these spills, excepting those incidents where TWC authorization and administration of expenditures from the Texas Spill Response Fund is deemed necessary. Oil spill cleanup and restoration activities by the responsible person will be to the satisfaction of a TRRC representative for spills where TRRC responsibility is designated. In the case of disposal of materials subject to oversight of the TRRC, disposal shall be in a manner acceptable to and in a site approved by the TRRC. Any temporary storage area for recovered materials shall also be approved prior to use. The reclamation feasibility of the removed material should be examined in all cases.

LETTER 7

2-28-87

Dear Mr Haigh,

7-1 I am writing to express my strong desire for you to include the alternative of having no pipeline in the EIS for the Celeron pipeline. Hundreds of miles of pipeline across our state will endanger our waterways & acquifers as well as many species of plants and animals already on endangered species protection lists. Please protect our natural resources.

Sincerely,
Dolly Lambdin Austin, Texas

RESPONSE TO LETTER 7

7-1 Your comment regarding support of the No Project Alternative is noted. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172.

LETTER 8

RECEIVED
BUREAU OF LAND MANAGEMENT
1987 MAR -4 PM 12:52
CALIF. DISTRICT
RIVERSIDE, CA.

March 2, 1987

Gentlemen.

8-1 After working in the energy field as a start up Mechanical Engenier for More than 30yrs. & Over Seas since 1969. I am surprised that Engineers have Not Come up With a better System to Cross Hayes & Travis County's. Where all the problems are taking place.

If You are interested in a better design & pipe line system, One that I believe Can be Sold with out any Controversy. I do not live in either County.

Regards
Charles J. Schell
745 Driftwood Dr.
Marble Falls, Tx. 78654

RESPONSE TO LETTER 8

8-1 Your comment regarding construction and operational procedures for the All American Pipeline in Hays and Travis Counties is noted. Please see pages 2-27 through 2-30 of the Draft SEIS and Modifications and Corrections Section 3.2 of the Final SEIS for pages 2-27 through 2-30.

LETTER 9

SIERRA CLUB

AUSTIN REGIONAL GROUP

9-1 The Austin Sierra Club takes the position the most environmentally sensitive and sensible choice is the No Project Alternative as outlined in section 2.0 of the Draft Supplemental Environmental Impact Statement to the proposed All American Pipeline Project.

9-2 We feel that this alternative provides the most protection for endangered species that would otherwise be effected by the northern and southern alternatives. The problem of accidents due to construction activities crossing existing pipelines can overcome by emphasizing proper safety and education programs by construction companies in regards to field superintendents and machinery operators.

Signed,
Charles Siller
Conservation Chair
Austin Regional Group,
923 Cardinal Lane
Austin Tx. 78704

"When we try to pick out anything by itself, we find it hitched to everything else in the universe." *John Muir*

RESPONSE TO LETTER 9

9-1 Your comment regarding support of the No Project Alternative is noted. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172.

9-2 Your comment regarding safety and education programs for the construction companies and their workers has been noted by the BLM. The BLM Authorized Officer will oversee construction of the pipeline from McCamey, Texas to the Gulf Coast.

LETTER 10

National Audubon Society
SOUTHWEST REGIONAL OFFICE
2525 WALLINGWOOD, SUITE 1505, AUSTIN, TEXAS 78746 (512) 327-1943

STATEMENT OF
MURRAY T. WALTON
SOUTHWEST REGIONAL REPRESENTATIVE
NATIONAL AUDUBON SOCIETY
AT THE
BUREAU OF LAND MANAGEMENT HEARING
ON THE
DRAFT SUPPLEMENTAL EIS
PROPOSED ALL AMERICAN PIPELINE
AUSTIN, TEXAS MARCH 2, 1987

I am Murray T. Walton, Southwest Regional Representative of the National Audubon Society. The National Audubon Society has been dedicated to the conservation of wildlife and other natural resources since 1905. We have begun review of the Draft Supplemental Environmental Impact Statement, Proposed All American Pipeline (DSEIS) and appreciate the opportunity to comment here tonight.

10-1 The National Audubon Society believes the Bureau of Land Management (BLM) has produced a comprehensive description of the project alternatives and affected environments. Furthermore, we are in agreement with the BLM's preference for the Northern Alternative (DSEIS p. S-3) should the project be necessary. The Proposed

10-2 Route which would cross the Edwards Aquifer is least preferred due to the biota and recharge characteristics of that aquifer. However, we note three serious flaws

10-3 with the DSEIS: 1) fish and wildlife mitigation measures include only avoidance of adverse impacts where possible and no real compensation for damages, 2) compliance/monitoring

10-4 plans are yet to be developed, and 3) oil spill contingency

10-5 plans have not been developed yet. The National Audubon Society believes that these matters are integral parts of the project and should be subject to public review and comment.

Thank you.

Louisiana, Mexico, New Mexico, Texas
AMERICANS COMMITTED TO CONSERVATION

RESPONSE TO LETTER 10

10-1 Your comment regarding support for the Northern Alternative is noted.

10-2 Your comment regarding the sensitivity of the Edwards Aquifer, especially the biota and recharge characteristics, is noted.

10-3 The measures designed to mitigate impacts to fish and wildlife resources specifically include compensation for damages to certain resources (e.g., riparian habitats); see revised Mitigation Measure TB-1 in Appendix A. The specifics of compensatory mitigation will be developed following selection of the final route, fine-tuning the ROW centerline, and other more detailed planning. The USFWS and BLM will be involved in final development of construction and operation compliance and monitoring plans.

10-4 Please refer to the response to Comment 10-3.

10-5 AAPL is not required to submit the Oil Spill Contingency Plan until six months prior to operation. However, to ensure that the Oil Spill Contingency Plan is compatible with the SEIS objectives, Mitigation Measure SS-1 in Appendix A outlines the appropriate procedures for the contingency plan. The Oil Spill Contingency Plan will be reviewed by the BLM, COE, DOT, TRRC, and other interested Texas state agencies.

Please see Appendix B of the Draft SEIS and the Modifications and Corrections section for Appendix B in the Final SEIS.

LETTER 11

March 9, 1987

11-1 For Proposed Route:
I do not want the pipeline. It will be on part of my property at Blanco, texas (west north)
I have 3733 acre Ranch 1 mile from Blanco, highway 281.
I want the Northern Route.

11-2 I have Large stock tanks with fish and if this goes through a lot of fish will be dead in one tank.

11-3 Also I do not want it over the water that San Antonio uses or may use.
I was approched on my property by phone and not by Letter. I told them to send me a Letter so I would see what they were talking about. they wanted me to agree by phone on amount

RESPONSE TO LETTER 11

11-1 Your comment regarding support for the Northern Alternative and opposition to the Proposed Route is noted.

11-2 The BLM Authorized Officer will work with AAPL to minimize the impact on such facilities as stock tanks by minor realignment of the ROW. The pipeline should not affect the stock tanks or fish.

11-3 Your comment regarding the location of the pipeline near the San Antonio municipal use area is noted.

LETTER 11

they would pay but I wouldn't do that over phone.

My property is very, very hilly and bad for a large runoff if something broke of pipeland, property called "Brushy top Ranch" on highway 281

It is water, main problem, so put it on the northern part.

11-4 Barton Springs in austin, texas is a popular spring fed city pool area that the city of austin has spent money around the area to keep springs running clean. I am saying this because these are springs and an oil spill could harm the area of the spring water. this is one of the landmarks in austin, texas

Sincerely,

Lem Scarbrough Jr.
717 Scarbrough Bldg
austin, texas 78701

RESPONSE TO LETTER 11

11-4 Your comment regarding recreational use of Barton Springs in Austin and the potential adverse impacts to the Springs has been noted.

LETTER 12

GEORGE HUMPHREY'S STATEMENT ON ALL-AMERICAN PIPELINE E.I.S.

From the testimony you have received on this controversial project in the past few months, you must realize how important the Edwards Aquifer is to the people of Austin and Central Texas. The waters of the Aquifer provide both recreational activities in the form of Barton Springs, and life in the form of drinking water for both people and livestock.

12-1 As an Austin City Councilmember, I appreciate the BLM's preliminary decision to route the pipeline to the Northern Alternative instead of across the Barton Springs portion of the Edwards Aquifer. The Council has worked for years to protect the Aquifer. A decision to move the pipeline would be a major step in protecting this vital resource. I hope you reconfirm your decision once you have received public input on the EIS.

12-2 However, I am concerned about two points in the Environmental Impact Statement as it concerns Celeron's original proposed route. First, the BLM would lead us to believe that the safety features that Celeron has proposed for the portion of the pipeline over the Recharge Zone are adequate to protect the Aquifer from damage. I find it hard to believe that there are safety features which are adequate to protect such a fragile environment from a pressurized, 30-inch hot oil pipeline carrying several hundred thousand barrels of hot crude daily. The honeycombed limestone of the Aquifer Recharge Zone is very porous and absorbent. It would only take one accident on a pipeline of this magnitude to ruin our water. The Shell Pipeline spill last August should testify to how quickly oil can spill.

12-3 Secondly, the BLM states that any route of the pipeline would take it across several aquifers, and that the Northern route is slightly better than the others in terms of environmental impacts. It concerns me that the Edwards Aquifer, which is in fact the source of drinking water for many Texans, is not given priority in the BLM's consideration. I believe that there are many people in the Austin area who would strongly disagree with you. I do not think that in this case that all things are equal. You must give the Edwards Aquifer preferential treatment, in order to protect this very important source of water from potential damage. Our aquifer is much more vulnerable and much important to us than the BLM would have you believe.

I ask you to consider what is at stake, and reconfirm your initial decision to move the pipeline. I believe that a moving the pipeline route is in the best interests of everyone in Texas.

Thank you.

RESPONSE TO LETTER 12

12-1 Your comment regarding support of the Northern Alternative is noted. Also, your comment regarding opposition to crossing the Edwards Aquifer at Barton Springs is noted. Please refer to the response to Comment 11-4.

12-2 Your comment regarding contamination of the Edwards Aquifer by a large spill at a sensitive location is noted. Please refer to the response to Comment 1-1 regarding the vulnerability of the Edwards Aquifer to a potential oil spill.

12-3 The intent of the BLM statement was to show that each of the routes has potential significant environmental impacts. However, the Northern Alternative has a better opportunity for mitigation of impacts and thus became the Agency's Preferred Alternative. Also, the BLM analyzed all the factors that would affect selection of their preferred route, including such resources as surface water, groundwater, endangered species, aquatic biology, and other sensitive features along all three routes. The Draft SEIS did not focus solely on groundwater.

LETTER 13

RICHARD and CHERIAL MATHENEY

Star Rt. 1B, Box 208-A
Dripping Springs, Texas 78620
(512)858-7221

March 2, 1987

TO WHOM IT MAY CONCERN:

We appreciate being sent the "Draft Supplemental E.I.S." for our review. Much of the report was way over our heads because it dealt with specific engineering/etc. terminology.

13-1 However, one thing did come across loud and clear to us. Irregardless of the numbers, an oil spill is possible over the Edwards Aquifer should this pipeline be built. We don't care what the odds are, or in how many years, ONE SPILL OVER THE AQUIFER AT ANY TIME, IN ANY PLACE, IN ANY AMOUNT IS TOO MUCH OF A RISK.

THIS IS THE ONLY WATER SOURCE FOR THOUSANDS OF PEOPLE. That makes it, in our minds, unthinkable to allow anything to be built that would in any way risk pollution of the aquifer.

This area is going to grow, if the experts are correct, by leaps and bounds. This growth in families is going to put even more of a demand on the Aquifer which makes it even more important to protect it from pollution.

If you know what a honeycomb rock is, you can imagine what the aquifer is like underground. It would be impossible to pump out all the pollutants, oil or otherwise, out of the little nokes and crannies that make up an environment like the surface of a honeycomb rock.

Please, stop this pipeline or anything else that would endanger this sole source water supply.

Sincerely,

Richard Matheney

Richard A. Matheney

Cherial A. Matheney

Cherial A. Matheney

RESPONSE TO LETTER 13

13-1 Your comment regarding the construction of the pipeline along the Proposed Route and your concerns regarding contamination of the Edwards Aquifer are noted. Please refer to the response to Comment 1-1 regarding the vulnerability of the Edwards Aquifer to a potential oil spill.

LETTER 14

League of Women Voters of the Austin Area

1011 WEST 31ST STREET AUSTIN, TEXAS 78705
512-451-6710

March 2, 1987

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

14-1 I support your conclusion based on the Environmental Impact Statement that the proposed All American Pipeline should not pass through central Texas. My main concern as stated at the public scoping meeting of last August is the necessity and benefit of maintaining the Edwards Aquifer as a water resource.

14-2 I take issue with many of the conclusions in the EIS, for example, the results of a worst case scenario oil spill on Onion Creek and the Edwards Aquifer. The construction process itself would have significant destructive effects on the terrain and on the aquifer which thousands of people depend on as a water resource, not to mention the results of a major oil spill.

14-3 The Hill Country of central Texas, relatively undiscovered until Lyndon B. Johnson became President of the United States, is the most scenic and desirable recreational and living area of Texas and every effort should be made to maintain the land and water resources of this valuable area.

Thank you.

Yours truly,

Karen A. Haschke
Program Vice-President

RESPONSE TO LETTER 14

14-1 Your comment regarding your opposition to the Proposed Route is noted.

14-2 Your comments regarding the oil spill scenario and construction effects are noted. The Onion Creek to Edwards Aquifer Oil Spill Scenario has been rewritten; please refer to Appendix B of the Final SEIS. Please also refer to Mitigation Measure GW-1 in Appendix A of the Final SEIS.

14-3 Your comment regarding the aesthetic and recreational value of the Hill Country and the importance of maintaining the integrity of the land and water resources has been noted. Thank you for commenting.

LETTER 15

City of Austin

FOUNDED BY CONGRESS, REPUBLIC OF TEXAS, 1839

SALLY SHIPMAN
COUNCIL MEMBER

P.O. BOX 1088
AUSTIN, TEXAS 78767
A/C 512 499-2253

March 2, 1987

Mr.William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

15-1 I appreciate the chance to comment on the Draft Environmental Impact Statement regarding the route of the All-American Pipeline. The proposed route has caused great alarm to many of us in Austin. Numerous people get their drinking water directly from the aquifer and many more enjoy recreational opportunities afforded by its cool water. For years we have diligently been working to protect the water in the Edwards Aquifer. Several years ago I began working with the Small Cities Council to create the Edwards Aquifer Underground Water Conservation District. Much progress has been made; if you knew how many hours had gone into creating that District, you would realize how important the Aquifer is to Austin and surrounding communities.

We are extremely concerned that one company could possibly destroy our aquifer. An accident has the potential to wreak havoc on our water supply, harming both residents and businesses in South Austin. Our plea to move the Pipeline is made not simply to save our water, but to protect our homes, our creeks, and our investments.

15-2 Please follow the recommendation of the Draft Environmental Impact Statement. The people of Austin will thank you.

Sincerely,

Sally Shipman
Council Member

RESPONSE TO LETTER 15

15-1 Your concern regarding potential impacts of the Proposed Route on the Edwards Aquifer is noted. Please refer to the response to Comment 1-1 for a discussion of potential impacts to the Edwards Aquifer.

15-2 Your comment regarding support for the Northern Alternative is noted.

LETTER 16

STORM Ranch
POLLED HEREFORDS
DRIPPING SPRINGS, TEXAS • 78620
512/858-4243

March 2, 1987

TO: B.L.M. HEARING

16-1 First, I would like to add my congratulations to E.R.T. Company and the B.L.M. for a monumental job in the preparation of the "Draft Supplemental E.I.S." and I certainly agree with their conclusion as summarized on page S.5 of the statement in which theB.L.M. recognizes the importance of the pipe line avoiding the sole source Edwards Aquifer.

16-2 There is, however, one part of the statement which seems to me to be out of focus. That is the section in which the "Onion Creek to Edwards Aquifer oil spill scenario" is presented - in Appendix "C" of the Appendices. In that scenario a series of events is assumed to occur at a certain time and place all under certain circumstances to create a "worst case scenario." The concept is used extensively in the solutions to problems involving multiple choice situations. The system is also used to formulate emergency procedures to cope with such situations.

However, in the summary for "assumptions for spill event" on page C-7, the report deals with a pipeline with an estimated life of 40 years and after enumerating the many assumed events and conditions that have to occur at a given time - then wind up with stating that the possibiity of this scenario occurring to be once in 8,900 years. It seems to me the emphasis on this probability dominates the scenario and creates the impression that: once in 8,900 years - why worry.

I therefore believe the implication of this scenario is misdirected, misleading and of little value.

Sincerely,

Lynn Storm

Lynn Storm
Star Rt. 1B, Box 106
Dripping Springs, Texas 78620

RESPONSE TO LETTER 16

16-1 Your comment regarding support for the Northern Alternative and opposition to the Proposed Route, in particular the impacts on the sole-source Edwards Aquifer, is noted.

16-2 Your comment regarding the Onion Creek to Edwards Aquifer Oil Spill Scenario is noted; the scenario has been revised in Appendix B of the Final SEIS. The probability associated with this event (e.g., once in 8,900 years) is not intended to decrease the significance of the impacts on the aquifer, should a spill occur.

LETTER 17

Bill Aleshire
COUNTY JUDGE, TRAVIS COUNTY

Travis County Courthouse Annex
P.O. Box 1748 Room 206
Austin, Texas 78767
512 473-9555

STATEMENT BY BILL ALESHIRE, TRAVIS COUNTY JUDGE

ALL-AMERICAN PIPELINE HEARING

BEFORE THE U.S. BUREAU OF LAND MANAGEMENT

MARCH 2, 1987

THOUSANDS OF RESIDENTS OF TRAVIS COUNTY DEPEND ON THE EDWARDS AQUIFER AS THEIR SOLE SOURCE OF WATER. WE IN CENTRAL TEXAS CHERISH OUR GROUND WATER AND SURFACE WATER, AND THERE IS NO BATTLE CRY WHICH GETS A LOUDER OR BROADER RESPONSE THAN WHEN THAT WATER IS THREATENED. WE'RE ADMITTEDLY AND UNASHAMEDLY SENSITIVE ABOUT PROTECTING THIS PRECIOUS RESOURCE.

EFFORTS BY TRAVIS COUNTY GOVERNMENT TO REQUIRE A PRUDENT PROCEDURE FOR PLANNING, ROUTING, AND BUILDING THE ALL-AMERICAN PIPELINE WERE STARTED BY MY PREDECESSOR, MIKE RENFRO. FRANKLY, I SUSPECTED THOSE EFFORTS WERE DONE MORE FOR PUBLICITY STUNTS DURING AN ELECTION YEAR THAN LEGITIMATE CONCERNS ABOUT THE CONSTRUCTION OF THIS PIPELINE. BUT THEN I SAW THE EVIDENCE BEING AMASSED BY THE COUNTY ATTORNEY'S OFFICE. THE AQUIFER IS A VERY SENSITIVE GEOLOGIC FORMATION AND WE HAVE GOOD REASON TO BE GRAVELY CONCERNED ABOUT EVERY PIPELINE OVER IT AND PARTICULARLY CONCERNED ABOUT THIS ONE.

WE CAST NO ASPERSION ON ALL-AMERICAN. WE UNDERSTAND THAT CONSTRUCTION OF THIS PIPELINE IS DEEMED TO BE IN THE PUBLIC INTEREST AND IN THEIR BUSINESS INTEREST. WE APPRECIATE THEIR WILLINGNESS TO TAKE THE TIME TO HAVE THE BUREAU OF LAND MANAGEMENT ANALYZE THE RISKS THEY WOULD TAKE WITH BUILDING THIS PIPELINE OVER OUR AQUIFER. WE ARE PLEASED, SO FAR, WITH THE TENTATIVE CONCLUSION THE BUREAU HAS REACHED IN PREFERRING THE NORTHERN ROUTE FOR THE PIPELINE.

17-1 BUT WE BELIEVE STRONGLY THAT YOU WILL REACH A MORE FIRM CONCLUSION AFTER LISTENING TO THE EXPERT TESTIMONY TRAVIS COUNTY AND OTHERS WILL PRESENT DURING THESE HEARINGS OVER THE NEXT FEW WEEKS THAT THIS PIPELINE SHOULD NOT BE BUILT OVER THE EDWARDS AQUIFER. NO SENSIBLE HUMAN BEING WOULD EXPECT A MAJOR PIPELINE PROJECT LIKE THIS SHOULD BE BUILT WITHOUT A CAREFUL, SCIENTIFIC ANALYSIS OF THE ENVIRONMENTAL IMPACT IT MIGHT HAVE.

17-2 THROUGH THE LEGAL PROCESS OF CHALLENGING ALL-AMERICAN, IN JANUARY, 1986 (THAT DATE IS IMPORTANT) OUR ATTORNEYS WERE GIVEN ACCESS TO THEIR COMPANY RECORDS RELATING TO THE ENTIRE PIPELINE PROJECT FROM CALIFORNIA TO WEBSTER, TEXAS. WE MADE COPIES OF EVERYTHING THEY HAD. ONE DOCUMENT WAS OVER 40 FEET LONG, AND WE COPIED IT WITH A VIDEO CAMERA. I HAVE A COPY OF THAT VIDEO TAPE WHICH I WILL SUBMIT TO YOU TODAY.

RESPONSE TO LETTER 17

17-1 Your comment regarding your opposition to the Proposed Route is noted.

17-2 Your comment regarding the All American Pipeline and the support documentation is noted by the BLM. The intent of the SEIS is to evaluate impacts along all three alternatives, plus the No Project Alternative. The SEIS evaluates these alternatives in an objective manner and is the basis for the BLM's determination of the Agency Preferred Alternative and for mitigation recommendations to reduce or eliminate significant impacts.

LETTER 17

IT SHOWS A MAP IN THEIR ENGINEER`S OFFICE OF THE ENTIRE ROUTE OF THE PIPELINE. WE WERE SHOCKED TO DISCOVER ON THAT MAP IN JANUARY, 1986 AT MCCAMEY, TEXAS THEY SHOWED FOUR ALTERNATE ROUTES: ONE NORTH OF, ONE SOUTH OF, AND TWO ACROSS OUR AQUIFER. THIS MAP EXISTED BEFORE OUR FORMAL LEGAL CHALLENGE BEGAN, BUT IT SHOWS THAT ALL-AMERICAN REALIZED EVEN THEN THAT THERE ARE ALTERNATIVES TO TAKING THE ROUTE OVER OUR AQUIFER. HOW DID ALL-AMERICAN DECIDE WHICH ROUTE TO CHOOSE? WHERE ARE THE ENVIRONMENTAL, TECHNICAL, AND ECONOMIC ANALYSES TO SUPPORT THE CHOICE THEY MADE?

17-2 Cont.

WHILE WHAT WAS IN THOSE FILES IS IMPORTANT, WHAT WAS ABSENT IS OF GREAT CONCERN TO US ALSO. IN THEIR ENGINEER`S FILES, UNDER PROJECT #1082, WERE THREE FILES CONCERNING ENGINEERING STUDIES OF THE PORTION OF THE PIPELINE FROM MCCAMEY TO WEBSTER. THE FILE LABEL ON FILE #4.1 SAID IT CONTAINED ENGINEERING REPORTS ON RIVER CROSSINGS. THE LABEL ON FILE #4.2 SAID IT CONTAINED GEOTECHNICAL STUDIES. AND THE LABEL ON FILE #4.3 SAID IT CONTAINED HYDROLOGICAL REPORTS.

THEY WERE ALL EMPTY, AND WHEN OUR ATTORNEY ASKED THE ENGINEER ABOUT THAT, THEY CONFIRMED THAT THEY HAD NOT DONE THOSE STUDIES AND DID NOT HAVE DEFINITE PLANS TO DO THEM. YET, THE CHOICE OF WHICH OF THE FOUR ROUTES TO USE HAD ALREADY BEEN MADE.

THIS SHOULD HIGHLIGHT FOR YOU THE IMPORTANCE OF THE BUREAU`S HEARINGS. IF SERIOUS, SCIENTIFIC ANALYSIS OF THE ENVIRONMENTAL IMPACT OF THIS PIPELINE OVER OUR AQUIFER IS TO BE CONSIDERED, IT WILL OCCUR THROUGH THESE HEARINGS. WE HAVE NO REASON TO BELIEVE IT WILL BE A NATURAL BYPRODUCT OF THE BUSINESS DECISIONS MADE TO DATE BY THE ALL-AMERICAN PIPELINE COMPANY.

AT THE END OF THESE HEARINGS, I HOPE YOUR FIRM CONCLUSION WILL BE THAT ALL-AMERICAN CAN BUILD THE PIPELINE IF THEY DO IT RIGHT, BUT NOT RIGHT OVER OUR AQUIFER.

RESPONSE TO LETTER 17

LETTER 18

COOPER ASSOCIATES
503 BOOTH DRIVE, SAN ANTONIO, TX 78216; (512) 340-7775

TESTIMONY OF DR. RALPH COOPER
HEARING ON THE DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT
PROPOSED ALL AMERICAN PIPELINE PROJECT

MARCH 3, 1987

INTRODUCTION

I am Dr. Ralph Cooper, a resident of San Antonio. I am an independent professional consultant on hazardous materials management and hazardous waste minimization. In my practice, I help clients with such matters as contingency plan development.

Prior to my present practice, I worked at Battelle, managing the preparation of Environmental Impact Statements, including at least one which involved some members of the ERT team who prepared this EIS. In that role, I supervised the preparation of the EIS, and also served as the principal analyst for accident scenario development and analysis and for development of mitigative alternatives including contingency plans.

Although I requested the DSEIS sometime ago, I received it only last Friday. Thus my review has been limited to the document itself and to my existing knowledge of the environment. I have not been able to pursue the referenced materials nor to check certain assumptions on which some of the key analyses are based. A second limitation on my review is that I am currently performing a waste management study and audit for a major refinery, one which probably will receive some of the oil to be carried by the proposed pipeline.

GENERAL COMMENTS

Based on my limited review, the DSEIS is well-prepared and reflects a careful and well developed analysis. There are a few areas which need attention; however, this is the purpose of the DSEIS. From my experience in your shoes, I am sure that you will hear about those again and again during the hearings.

Concern: Protecting the Edwards

18-1 My major environmental concern is protecting the water supply for San Antonio. A second concern is the more general protection of the environment. In this regard, I have some question regarding the analysis of flows and whether the pipeline, in its proposed routing would or would not threaten the quality of water in that portion of the Edwards Aquifer which supplies San Antonio, either directly at the point where the pipeline crosses the recharge zone, or through migration of a spill in the area north of the recharge zone.

RESPONSE TO LETTER 18

18-1 Your concern regarding protection of the San Antonio water supply and its relationship to the Edwards Aquifer are noted. Please refer to the response to Comment 1-1 regarding the vulnerability of the Edwards Aquifer to an oil spill.

LETTER 18

All American Pipeline DSEIS Testimony
March 3, 1987, page 2.

Environmental Insurance

18-2 One issue which disturbs me is the concept that $10,000,000 is a sufficient amount of insurance to be carried by the pipeline to remedy the effects of a pollution event involving one of the two more vulnerable aquifers along the proposed route. Groundwater decontamination projects typically involve that amount for construction and a similar amount for annual operation for several years, plus the cost of an alternative water supply. Thus, if the aquifers are so vulnerable so as to result in a relocation of the pipeline and this threat cannot be mitigated so as to make the routing acceptable, then the insurance requirement should be at least an order of magnitude larger. By my view, additional mitigation is a preferred approach.

Preferred Alternative

Accepting the DSEIS groundwater threat analysis, however, and with some additional mitigation measures such as those I will suggest below, I do not understand the declaration of the Northern Alternative as the BLM preferred alternative, since the risk of a spill is small and the risk of contamination of the aquifer, given a spill, is also small, and both can be reduced. However, I would recommend some additional mitigation measures be included in the requirements which BLM will make a part of the Record of Decision. These I have placed into two categories: Contingency Planning and Mitigation.

CONTINGENCY PLANNING

2-55

Contingency planning is a key aspect of the ability of All American to respond to the almost inevitable spill event. Even more likely than the spill event is the inadequacy of the contingency plan and other emergency preparedness activities likely to be undertaken by the organization. Few such plans prove adequate in an emergency, because the planners do not expect them to be used, and do not commit sufficient resources.

Development/Review by Independent Professionals

18-3 Since the contingency plan is critical to environmental protection, the ROD should require that the contingency plan be developed in coordination with and approved by an independent organization which is professionally experienced in the development and use of contingency plans for oil spills. There is such an organization in Texas, Texas A & M University's Engineering Extension Service, Oil & Hazardous Materials Control Division; this group operates an Oil Spill Control School and has assisted in contingency plan related work for the oil industry in a variety of locations including several foreign countries and the Alaskan North Slope. There may be other similarly qualified groups.

Practices and Tests

18-4 Second, contingency plans, to be effective, must be practiced and reviewed regularly. The ROD should require that All American engage in at least one full scale field exercise each year, designed and implemented by an outside organization, as well as other exercises, such as desk-top tests and response time checks.

RESPONSE TO LETTER 18

18-2 The All American Pipeline Company (AAPL) is a subsidiary of the Celeron Pipeline Company which is a subsidiary of Goodyear Tire and Rubber Company. AAPL is covered under Goodyear's umbrella liability policy for $20,000,000 for damages that might result from construction, operation, and abandonment of the proposed pipeline.

18-3 Mitigation Measure SS-1 requires an Oil Spill Contingency Plan for the All American Pipeline. This plan is subject to the review and approval of the BLM, COE, DOT, and TRRC. Neither line fill nor operation of this pipeline may occur until an approved Oil Spill Contingency Plan is in place. Appendix B in the Draft SEIS presents a preliminary Oil Spill Contingency Plan with the basic components that would be included in the final plan. Please see the Modifications and Corrections section for pages B-1 through B-66 for revisions to the preliminary Oil Spill Contingency Plan.

18-4 The suggestion for including periodic field exercises as a requirement in the Record of Decision goes beyond the authority of the BLM. BLM's jurisdiction regarding mitigation measures relates primarily to environmental issues associated with design and construction. Measures relating to pipeline operational practices are governed by both the DOT and TRRC, and such requirements are at their discretion.

LETTER 18

All American Pipeline DSEIS Testimony
March 3, 1987, page 3.

Other Training

18-5 Third, when an emergency arises, a plan is useless unless the personnel have appropriate knowledge and training. Congress has recently recognized this by requiring additional training for those who handle hazardous waste or who may be involved in emergency response related to hazardous waste. The ROD should require that all All American personnel receive training, including annual updates, at least 40 hours per year, plus participation in on site exercises.

Prestaging Response Equipment and Personnel

18-6 One area of concern is the apparent plan to respond to spills along the route from a central facility in Austin. This means that it may require several hours after an alert for the containment and clean up crew to arrive at the point of the spill. Once at the point of the spill, any additional equipment would have to be brought in from some distance. During this time, the extent of environmental contamination and damage would expand greatly.

An alternative approach is to prestage certain types of control equipment at intervals along the pipeline and to have a few key people trained in first response at such locations and able to reach any spill area within minutes. Ideally, these would be at or near points of particular environmental vulnerability, such as stream or river crossings and aquifer recharge features. The materials and equipment might include boats and floating booms, and kits for damming culverts or making an underflow device. The ROD should require All American to have a plan which, under all reasonably expected conditions, would have a trained responder to any point on the pipeline within 30 minutes after a leak is detected, and to stage minimally necessary containment equipment convenient to such responders.

Precontracting and Training Supporting Services

18-7 At many locations along the proposed routes, equipment and personnel capable of responding to a spill may already exist and may be closer to the site than the proposed All American Pipeline response team. A frequent barrier to the successful use of such personnel and equipment is the problem of contractual and financial arrangements and the lack of appropriate training. The solution is a program to identify such resources, resolve contractual and payment terms in advance, and provide appropriate training. The ROD should authorize All American to use this approach to response planning, if it would reduce the response time to below 30 minutes for all locations along the pipeline route.

ALTERNATIVE MITIGATION MEASURES

There are additional mitigation measures which should be considered by BLM for imposition on All American Pipeline Company and which would be beneficial in protecting the environment. The Final EIS address these and explain, if they are not included in the ROD, why they are not.

Grouting

18-8 The potential effect of a spill on the quality of water in aquifers crossed by the pipeline could be reduced by requiring additional grouting of the fractures in the overlying rock in the recharge zones crossed by the pipeline.

RESPONSE TO LETTER 18

18-5 Information on training of company personnel can be found on Page B-8 in Appendix B of the Draft SEIS. DOT regulations require initial training programs and reviews at a minimum of one year intervals. Please refer to the Modifications and Corrections section for Page B-8.

18-6 Where block valve closure and oil spill response times have been judged to be inadequate, Mitigation Measure SS-2 requires remote-control block valves in order to reduce potential oil spill volumes. The BLM Authorized Officer will also require, as part of Mitigation Measure SS-1, that the Emergency Response Team be able to respond to a pipeline leak at the sensitive location identified in Table 4-62 within approximately 1 hour. Where this is not feasible, a trained local responder and local storage of equipment will be required.

18-7 AAPL has the option for arranging contractual services as suggested to help contain and control an oil spill. Part of the review and approval of the Oil Spill Contingency Plan includes evaluating the training capabilities of the company and its contractors. AAPL has listed the following minimum criteria for selection of oil spill cleanup contractors:

a) Have a minimum of 10 years experience, collectively;

b) Can demonstrate ability to respond to a given spill site in the time alloted as described in the Oil Spill Contingency Plan;

c) Have adequate in-house mobile spill equipment, such as 6" and 12" river booms, sorbent material, skimmers, appropriately sized boats/motors, and other equipment identified in Oil Spill Contingency Plan; and

d) Have a good record for response and cleanup activities as stated by previous and/or current clients and/or pertinent government agencies.

LETTER 18

All American Pipeline DSEIS Testimony
March 3, 1987, page 4.

18-8 Cont. Such grouting is now required only in the trench of the pipeline and only as it crosses the Edwards Aquifer recharge zone. Such grouting or the development of a surface of less permeable clay should be considered for the right of way area where the existing soils are thin or permeable. The construction of a local "cap" in the area of highest spill threat would help to contain any spill above the surface and would make recovery more feasible and less costly.

Contouring

18-9 A related concept is that, while working in the right of way, the surface could be contoured or diversion dikes constructed so as to assist in containing any spill before it could reach a stream or recharge structure. Since in many areas along the pipeline route, there is little soil, making of such dikes at the time of a spill may be difficult. Prebuilding at the time of construction, when equipment is already present and earth is already being moved, should be considered as a mitigative measure.

Similarly, preconstructed places for control devices, such as dams or underflow weirs, should be considered for areas of high environmental sensitivity.

Maintaining Cleared ROW

18-10 The level of maintenance of the right of way is not at all clear in the DSEIS. This level should be specified and should require All American to keep the right of way free of brush and shrubs, limiting the cover to grasses. Other maintenance requirements should include maintaining the right of way so as to be passable by appropriate response vehicles.

The reasons for this are several. The proposed visual inspection from the air cannot be effective is the right of way becomes overgrown. Access to the pipeline in an emergency would also be hindered by overgrowth or the development of gullies or other barriers to equipment.

CONCLUSION

18-11 Additional mitigation measures should be required of the All American Pipeline by incorporating them in the Record of Decision and by an analysis of their effect in the final SEIS. This testimony has identified several such requirements, including improvements to the contingency planning proposed by All American and measures which would simplify the management of and recovery from a spill, when one occurs. If such measures are implemented, there is no reason for the BLM to prefer any of the alternatives over the proposed route.

18-12 Second, should a spill occur in such a location so as to contaminate an aquifer, the proposed insurance is nominal in amount and not likely to provide funds sufficient to correct any groundwater problems which might be caused by a spill from the pipeline. Those who oppose the proposed route on grounds of possible contamination of ground water supplies should insist on stronger guarantees or additional preventive mitigation.

Cooper Associates, 503 Booth Drive, San Antonio, Texas 78216

RESPONSE TO LETTER 18

18-8 The mitigation and special design measures recommended for the All American Pipeline consider the risk of an oil spill to a resource, the sensitivity of that resource to damage, and the extent and reversibility of the damage. Grouting was not considered an appropriate measure to mitigate potential impacts to other groundwater resources.

18-9 Please refer to Mitigation Measure S-1 in Appendix A.

18-10 AAPL has indicated they will maintain the ROW so as not to hinder the aerial reconnaissance or access of maintenance and response equipment. This is standard industry practice.

18-11 Text changes have been made to the Oil Spill Contingency Plan to reflect proper procedures for the BLM Authorized Officer to complete Mitigation Measure SS-1. Please see the Modifications and Corrections section for pages B-1 through B-66. Thank you for your support on the planning effectiveness. We believe that if the Oil Spill Contingency Plan is properly designed and implemented, impacts on surface water, terrestrial resources, and most groundwater resources can be minimized should an oil spill occur.

18-12 Please refer to the response to Comment 18-2 regarding AAPL's liability insurance coverage.

LETTER 19

Bureau of Land Management

March 3, 1987

San Antonio, Texas

Hearing on All American Pipeline Draft Environmental Statement

19-1 The Bureau of Land Management's recommendation that the proposed All American Pipeline's Northern Alternative Route is the preferred route is in the best interest of Central Texas by not exposing the delicate sensitive groundwater supply, the Edwards Aquifer to be subject to the risk of oil contamination. Texans must continue to be vigilant to any project that may endanger our sole water source and natural environment. More of us are becoming aware of the irreversible consequences of careless planning and faulty project construction. Continued pipeline construction only increases the risk of contamination due to multiplicity. Careful study now may avert problems of aquifer contamination that are prevalent in nearly all of the lower 48 states. I trust that this Environmental Impact Statement will set a precedent for insuring that future pipeline projects are subject to full and complete study of such pipelines on the Texas environment.

Joan West

207 Forrest Trail

Universal City, Texas 78148

(512) 658-2803

RESPONSE TO LETTER 19

19-1 Your comment regarding support for construction of the pipeline along the Northern Alternative is noted. Please refer to the response to Comment 1-1 regarding the vulnerability of the Edwards Aquifer to an oil spill.

LETTER 20

JOHN H. KOTHMANN
P.O. BOX 434
JUNCTION, TEXAS 76849

March 3, 1987

William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

In the past year or so your agency has heard a lot of input on the proposed pipeline.

I consider the main issue before this agency to be one very clear question. "What is the greatest good about this project for the greatest number of people?" If you examine this question completely, honestly, and without undue influence, I am confident that your role will have been well served and the interests of the people of this state and this country will have been properly served.

20-1 The report clearly states that no one route is significantly better than any of the others. If this is the case, why move from the proposed Central Route? A lot of educated folks have attempted to enlighten you on various potential dangers and possibilities that might exist if such a pipeline is constructed in a particular location rather than some other route. It appears to me that some of these folk have attempted to cloud the discussion with talk of dangers that could result only in the likelihood of extremely remote circumstances, if at all.

20-2 The frequency of a spill stated in your worst case scenario of once in 8,900 years sounds pretty good to me. I'll take those odds on getting home safely tonight.

20-3 One thing a review of the study shows is that a spill is most likely to occur only as a result of outside impact from other factors rather than natural causes. The Northern Route increases the distance of the

RESPONSE TO LETTER 20

20-1 Your comment regarding the environmental impacts of the Proposed Route relative to the alternatives and recommendation of the Proposed Route is noted. Please refer to the Modifications and Corrections Section for Table 2-12 in the Final SEIS. The Northern Alternative has the fewest long-term significant impacts and is the Agency Preferred Alternative.

20-2 Your comment regarding spill frequencies is noted.

20-3 As shown in the comparison of alternatives in the Modifications and Corrections section for Table 2-12, each of the routes has potential significant environmental impacts. However, the Northern Alternative has a better opportunity for mitigation of impacts and thus became the Agency Preferred Alternative. Also, the BLM analyzed all the factors that would affect selection of its preferred route, including such resources as surface water, groundwater, endangered species, aquatic biology, and other sensitive features along all three routes. The SEIS did not focus solely on groundwater.

LETTER 20

20-3 Cont. pipeline some 60 miles. With this increase in distance comes an increase in the likelihood of an increase in injuries, deaths, and cost of damages as shown in Table 4-10 of the impact study. The Northern Route puts the pipeline in contact with more people involved in more activities, more conflicting utility construction, more roads, more rivers, more communities and more human congestion over a greater area than does the proposed Central Route. This all adds up to a more intricate network of human activity.

20-4 The Central Route provides a shorter, more protected construction bed for the pipeline, fewer land-owners, with fewer agricultural and construction needs, more miles of uninterrupted right-of-way, and less contact with general public commerce - all of which enhance the safety of the pipeline's construction and its long term operation.

20-5 As the report shows, the greatest concern with the safety of the Central Route is limited to a 6 mile area along the Edwards Balcones Fault Zone. The report further addresses how this concern could be mitigated with extensive construction measures. It seems to me that logic concludes that it would be more sensible to utilize the route that can restrict its greatest potential danger to a limited area that could be greatly protected by advance construction technology and which could be closely monitored and supervised, than to change to a construction route that increases distance 60 miles and exposure to a greater frequency of human errors and mishaps.

There are additional questions that I don't feel have been adequately addressed.

20-6 Has there ever been significant damage to an aquifer due to a spill from a pipeline? I think the study does answer this question, at least indirectly, but from much of the presumptuous discussion I have heard on the subject one would not think so.

20-7 With all the emphasis on an oil spill polluting an underground aquifer, how does oil and water mix? Given the nature of an aquifer, how can 77 barrels of oil pollute the entire Edwards Aquifer as so many people have been led to believe?

RESPONSE TO LETTER 20

20-4 This information has been considered in the selection of the Agency Preferred Alternative.

20-5 The design for aquifer crossings proposed by AAPL (pages 2-27 through 2-30 of the Draft SEIS) relates to the sensitivity of that particular resource and the consequences should an oil spill occur in that region. Despite the extensive mitigation, there remains a small but finite risk of an oil spill at the Edwards Balcones Fault Zone. The determination of the Agency Preferred Alternative considers the acceptability of that risk.

20-6 Your comment regarding previously damaged aquifers by an oil spill is noted. Interviews with EPA emergency response oil cleanup branches from EPA Regions 2, 6, 8, and 9 indicate that no aquifers have been significantly polluted to date by an oil spill. Please refer to the response to Comment 22-3.

20-7 Your commments regarding the properties of oil and water and the mechanics of aquifer pollution are noted; please refer to the Modifications and Corrections Section 3.3 for revisions to Appendix A of the Draft SEIS concerning crude oil properties.

Regarding the Onion Creek to Edwards Aquifer Oil Spill Scenario, the scenario has been rewritten; please refer to Appendix B of the Final SEIS.

LETTER 20

20-7 Cont. Is the worst case scenario with a probability of less than once in 8,900 years going to result in 77 barrels of oil ending up in the aquifer and that it is going to ruin the water supply for the entire San Antonio - Austin region? Can it be true that such an incredibly unlikely possibility warrents changing the route to a longer distance at a cost of $50 - 60 million, and at the same time raise the price of gasoline for everyone? Is this what the impact study concludes?

20-8 The study has not proven adequate cause to move from the proposed route to the Northern Route. The proabilities stated in the worst case scenario are in error because they cannot remain the same when additional variable such as a concurrent rainstorm are added and the incident occuring with West Texas Intermediate Crude. Thus, the likelihood of spill of this significance is much less even than once in 8,900 years.

20-9 It seems to me there is a much greater threat of pollution from the long term use of the thousands of septic tanks and sewage accumulations filtering into the aquifer in this region than some projected oil pipeline rupture.

20-10 With this report, very logically, you have proven that the proposed Central Route is the proper route for this pipeline. So much has already been done to study and design for its needs that the greatest good can only be accomplished by building the pipeline along the proposed Central Route. Your enviromental study makes that fact very clear.

Thank you very much.

Cordially,

John Kothmann

John Kothmann

RESPONSE TO LETTER 20

20-8 The Onion Creek to Edwards Aquifer Oil Spill Scenario has been revised; please refer to Appendix B of the Final SEIS.

20-9 Your comment regarding the possible pollution of groundwater resources by poorly maintained septic systems is noted.

20-10 Your comment regarding support for the Proposed Route is noted.

LETTER 21

COUNTY OF GILLESPIE

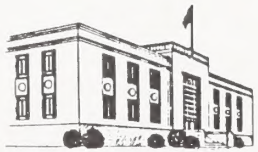
JAY WEINHEIMER
County Judge
P.O. Box 351
512-997-7502

MRS. DORIS LANGE
County Clerk
P.O. Box 551
512-997-6515

CLIFFORD J. HARLE
County Auditor
P.O. Box 1157
512-997-6777

JEANIE BEL CRENWELGE
County Treasurer
P.O. Box 787
512-997-6521

LEOLA BRODBECK, RTA
Tax Assessor-Collector
P.O. Box 168
512-997-6519



COMMISSIONERS
P.O. Box 351
512-997-7503

DAYTON F. HERBER, Pct. 1
Fredericksburg, Texas 78624

LEVY E. KUSENBERGER, Pct. 3
Fredericksburg, Texas 78624

JAMES T. McMAHON, Pct. 2
Harper, Texas 78631

ARTHUR L. HAHN, Pct. 4
Doss, Texas 78618

FREDERICKSBURG, TEXAS 78624

March 4, 1987

Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Re: Proposed All American Pipeline Project - Draft EIS

Gentlemen:

21-1 The Draft EIS for the proposed All American Pipeline Project states on page 3-2 and in Table 3-2 on page 3-5 that there are eight municipal water supplies located within 2 miles of the Proposed Route. The City of Fredericksburg is approximately 5 miles from the Proposed Route, but the water wells that provide 90% of the City of Fredericksburg water supply are located less than 1/2 mile from the Proposed Route. I believe that the City of Fredericksburg should be added to the list of affected municipal water supplies.

21-2 On page 4-31, the following statement is made. "The City of Fredericksburg's wells tap the downdip portion of the Ellenberger limestone and are therefore not expected to be significantly affected." The Hensell Sand overlies the Ellenberger Aquifer at the City water wells. A study by R.W. Hardin & Associates in March, 1979 showed that when the Ellenberger is pumped, the Hensell Sand is also drawn down, which indicates a connection between the two formations. Thus any oil spill in the Hensell Sand would reach the Ellenberger Aquifer and affect the municipal water supply as well as many private wells in Gillespie County. A copy of the 1979 study is attached.

I believe that the City of Fredericksburg municipal water supply, which serves over 8,000 residents in Gillespie County, both inside and outside the City limits, would be significantly impacted by an oil spill or oil leak. I encourage you to revise the EIS to make the Proposed Route unacceptable.

Very truly yours,

JAY WEINHEIMER
County Judge,
Gillespie County, Texas

RESPONSE TO LETTER 21

21-1 We agree with your comment that the City of Fredericksburg should be added to the list of municipal water supplies located within 2 miles of the Proposed Route. Based on your comment, text changes to pages 3-2 and 3-5 of the Draft SEIS are included in the Modifications and Corrections section of the Final SEIS.

21-2 Information on the Hensell Sand has been added to the description of the Ellenberger Aquifer; please refer to the Modifications and Corrections section for page 3-14.

In Gillespie County, the Hensell Sand overlying the Ellenberger Aquifer consists of poorly-sorted sand, silt, and clay with beds of limestone common. The upper part of the member is generally fine grained, while the lower part consists of coarse, angular sand.

A March 1979 aquifer test, conducted by R.W. Harden and Associates on behalf of the City of Fredericksburg, showed that in the vicinity of the Boerne 5 production well, there is communication between the lower ten feet of the Hensell Sand and the upper 150 feet of the Ellenberger Aquifer. According to the City Engineer, drillers' logs for this well indicate that the Hensell-Ellenberger contact is roughly 82 feet below surface and that most of the water comes from a fractured zone roughly 120 feet below ground surface.

The communication between the coarse, more permeable lower Hensell and the upper portion of the Ellenberger does not give an indication of the ease or difficulty a surface oil spill would have in penetrating the upper finer-grained Hensell and reaching the water table. In general, the rate and extent of subsurface oil migration is slower and less extensive in porous granular aquifers. The Ellenberger as a whole is not regarded as sensitive, therefore it is not included in Table 3-1. However, in Gillespie County the City of Fredericksburg has 5 water supply wells located less than 0.5 mile south of the Pedernales River and 1,000 feet north of the original Proposed Route. Because of the uncertainty in the communication between the Hensell Sand and the Ellenberger Aquifer in this area and because the Pedernales River may complicate the local hydrogeology, the area within 2,000 feet of any supply wells serving the City of Fredericksburg is considered sensitive.

Please refer also to Mitigation Measures GW-1 and GW-3 in Appendix A.

BOERNER 5 WELL CONSTRUCTION AND TESTING

Prepared for

THE CITY OF FREDERICKSBURG

By

R. W. HARDEN & ASSOCIATES
CONSULTING GROUND-WATER HYDROLOGISTS AND GEOLOGISTS
AUSTIN, TEXAS

March 1979

Production Well Construction

The Boerner 5 production well was constructed by reaming of the Boerner 5 test well. The test well was drilled to a depth of 305 feet by Virdell Brothers Drilling Company with an air rotary rig (See separate test well report: R. W. Harden & Associates, January 1978). The production well was completed in the Ellenburger by Layne-Western Company with an air-assisted reverse circulation rotary rig in November 1978. Initial testing of the well was done in December 1978, and final tests were completed in March 1979.

In constructing the well, a plug was first set in the test well at 93 feet to ensure that no cuttings would infiltrate any openings in the underlying water-bearing formation during construction operations for the production well. Next the shallow, temporary casing in the test well was pulled, and the hole was reamed to a diameter of 24 inches to a depth of 90 feet. Twenty-inch surface casing was set to a depth of 88 feet and pressure cemented. Below the surface casing, the test hole was reamed to a diameter of 18 inches to a depth of 180 feet. The final construction of the Boerner 5 well is shown in Figure 1.

Hensell Observation Well Construction

Approximately 16 feet east of the Boerner 5 well, a Hensell observation well was drilled in December 1978. The well was drilled to allow the observation of water levels in the Hensell during testing of the Boerner 5 well. The Hensell observation well was drilled by Virdell Brothers Drilling Company with an air-assisted rotary rig. The construction of the well is shown in Figure 2. The PVC screen is 10 feet in length and consists of 1/8-inch slots (70 openings per foot).

Pumping Tests

Final testing of the Boerner 5 well was done in March 1979. All water-level measurements were taken with an electric line. Pumping rates were measured using 7x10-inch and 8x10-inch orifices. During these

tests, City Wells 3 and 4 were not pumped. The only other large-capacity Ellenburger well in the vicinity is the City of Fredericksburg Hahn 1 well which was pumped intermittently during the day and was shutt off at night. The Hahn 1 well is located 4,000 feet southeast of the Boerner 5 well.

Initial tests consisted of two-hour step tests. A graph of the step tests is shown in Figure 3. The following table gives the results:

Pumping Rate (gpm)	One-Hour Drawdown (feet)	One-Hour Specific Capacity (gpm per foot of drawdown)
609	7.5	81
807	12.0	67
900	13.9	65
1,075	16.2	66
1,798	48.0	37

A 27-hour continuous test was run at 900 gallons per minute. During the test the Hensell observation well and the City of Fredericksburg Well 4 were also checked. The interference in the City of Fredericksburg Well 4 from pumping the Boerner 5 well at 900 gallons per minute for 27 hours was approximately 5 feet. The drawdown in the Hensell observation well due to the pumping for 27 hours at 900 gallons per minute was approximately 4 feet.

The drawdown in the Hensell well indicates a good connection between the Hensell and the Ellenburger. The test data and local geology indicate that lowering of water levels in the Ellenburger induces recharge from the Hensell. This assists in maintaining water levels in the City's Ellenburger wells.

Water Quality

Water samples were obtained from both the Hensell and the Boerner 5 wells. The results of chemical analysis of water obtained from the Boerner 5 well in November 1978 are included in Appendix 2. Additional

samples were obtained for chemical analysis and submitted to the Texas Department of Health in March 1979. The results were not available when this report was prepared and, therefore, will be submitted to the City separately.

Also included in Appendix 2 are the results of a bacteriological sample from the Boerner 5 well. It shows no colliform organisms present. The water quality for the Boerner 5 well is very similar to the quality of the water from the other City of Fredericksburg Ellenburger wells.

A copy of the results of chemical analysis of water obtained from the Hensell observation well is also included in Appendix 2. The results indicate water similar in chemical quality to that produced from the Ellenburger.

LETTER 21 (CONTINUED)

CITY OF FREDERICKSBURG
BOERNER 5 WELL CONSTRUCTION

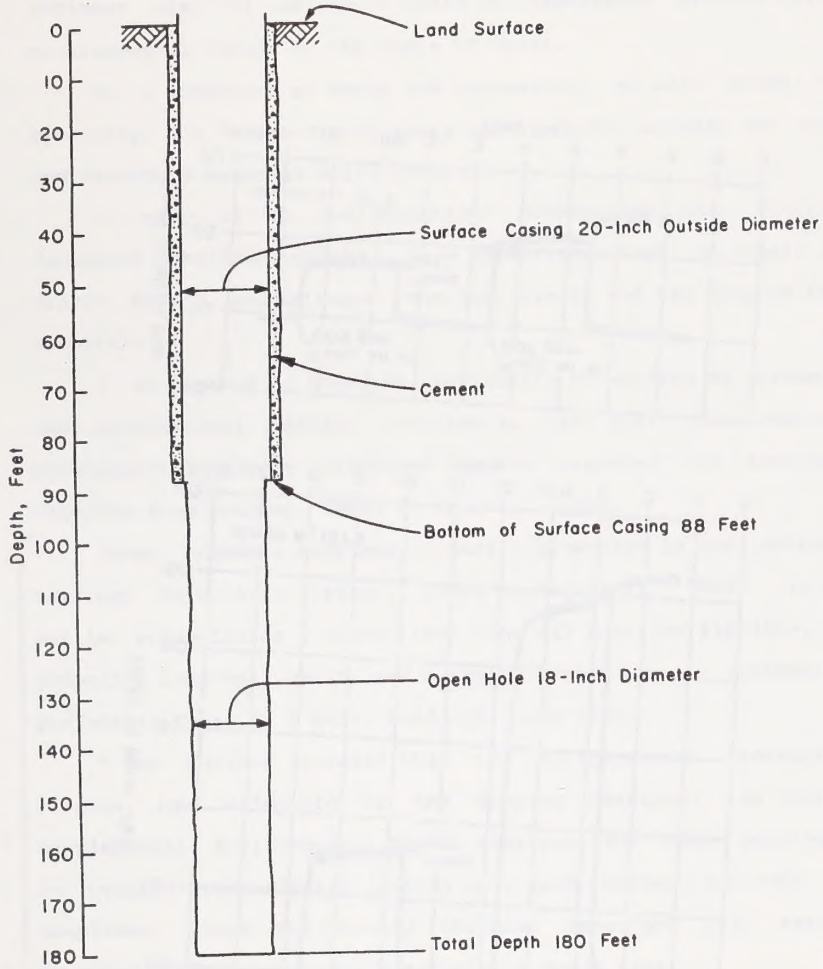


Figure 1

CITY OF FREDERICKSBURG
HENSELL OBSERVATION WELL CONSTRUCTION

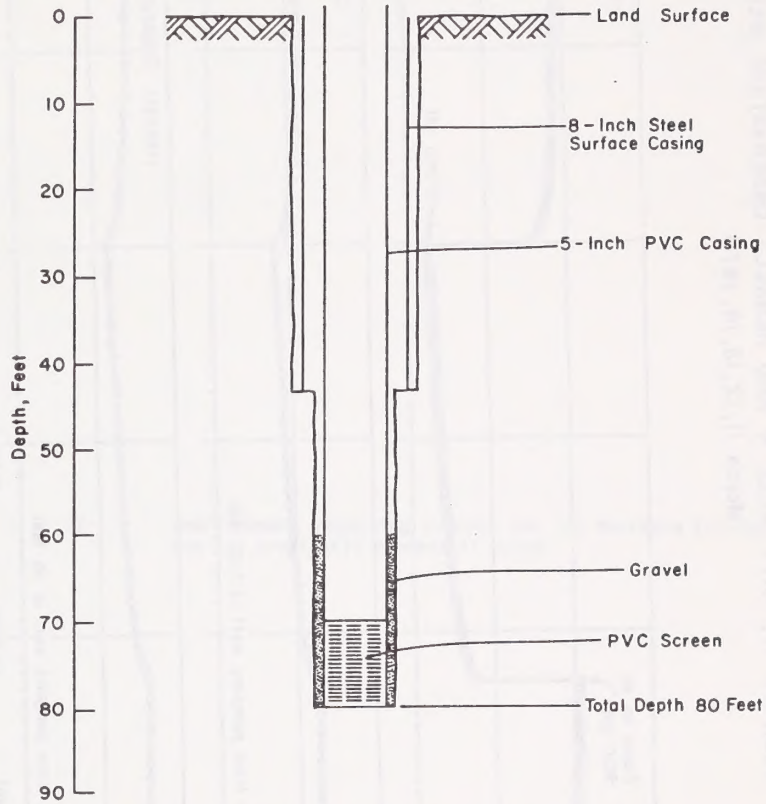


Figure 2

LETTER 21 (CONTINUED)

CITY OF FREDERICKSBURG INTERFERENCE TEST
BOERNER 5, CITY WELL 4 AND HENSELL OBSERVATION WELL
March 11, 12, 13, 14, 1979

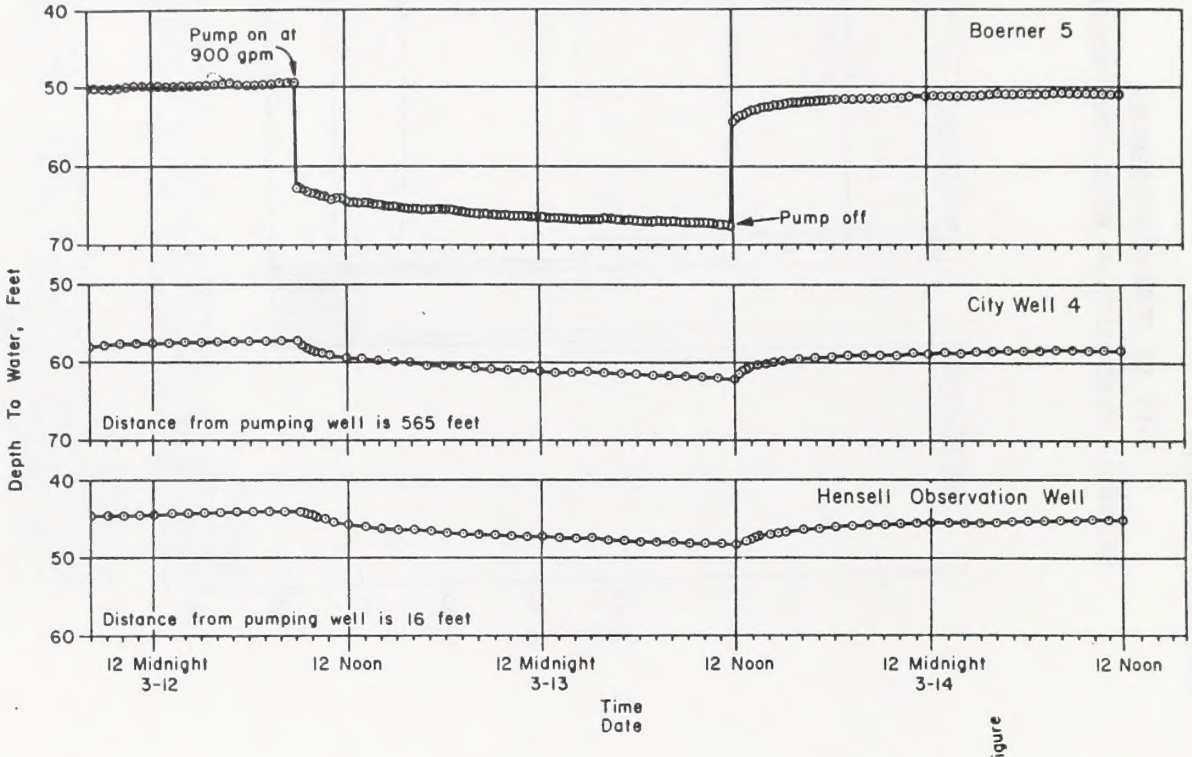
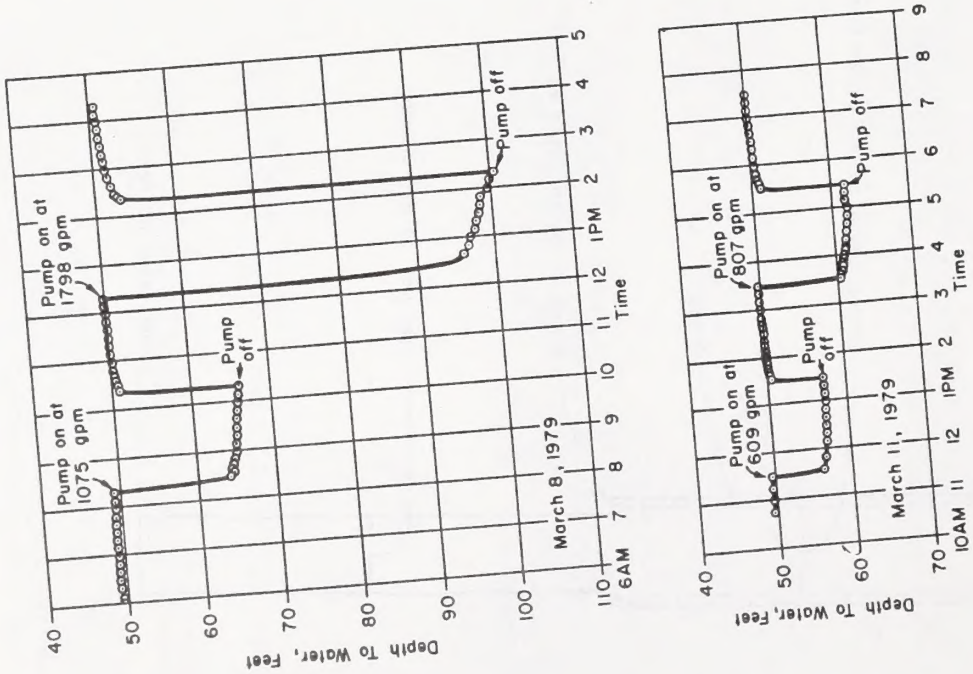


Figure 4

CITY OF FREDERICKSBURG STEP TEST
BOERNER 5
March 8, 11, 1979



Figure

LETTER 22

I am Roy W. Hann, Jr. I am a registered Professional Engineer with 24 of my 30 years of experience dealing with environmental issues of the State of Texas.

As a professor at Texas A&M University, my main areas of specialty are multi-disciplinary environmental studies and oil and hazardous material spill control.

A copy of my qualifications accompanies the written documents submitted ~~tonight~~ by 3/20/87. I am appearing tonight on behalf of Travis, Harris, and Gillespie Counties, Texas, and the City of New Braunfels.

I am pleased to have the opportunity to express my personal and professional opinion relative to the Draft Supplemental Environmental Impact Statement for the proposed All American pipeline from McCamey, Texas to Webster, Texas.

These comments supplement those I presented in the scoping hearings in College Station, Texas on August 21, 1986. In my earlier presentation I stated that "The All American Pipeline, if properly located, built and operated, will be a worthwhile project to Texas." I still hold that same view.

22-1 I am further pleased that the Environmental Protection process, as evidenced by the scoping hearings, the Draft Supplemental Environmental Impact statement and these hearings, is working properly and leading to a much better project. I compliment those individuals who have developed this vastly improved DSEIS document in a relatively short time.

My comments in this presentation endorse and reinforce the route selection recommended in the DSEIS and present

RESPONSE TO LETTER 22

22-1 Your comment regarding support for the Northern Alternative, the BLM, and the Draft SEIS process is noted.

LETTER 22

22-1 Cont. recommendations which I believe will enhance the final EIS and lead to further assurance of ~~the~~ a properly located, built and operated All American Pipeline.

In my written comments I discuss six topical areas:

I. Supporting Comments for the Northern Route Selection.

II. Recommendations Regarding Contingency Planning

III. Recommendation for Considering Higher Spill Volumes

IV. Concern Over Spill Control System Detection and Shutdown and Recommendations for a Test system to Assure Performance.

V. Concern Over Liability for Third Party Damages and Associated Recommendations.

VI. Appropriateness of Reference to Negotiation with the Edwards Underground Water District and other nit-pics.

Time does not permit me to discuss all of the areas in depth this evening. Thus I will focus on specific recommendations.

22-2 1. I recommend you remain with the Northern route choice and reinforce this decision primarily because

A: value of the Edwards' Aquifers and

B: technology does exist to deal with a spill on the Northern route - It does not exist to deal with a spill on segments of the original ~~prepared~~ proposed route.

22-3 2. In the Draft SEIS a creditable job has been done on administrative contingency planning and in specifying a response organization, but site specific planning and resource development have been recognized but largely ignored. To overcome this, I submit the following recommendations:

RESPONSE TO LETTER 22

22-2 Your comment regarding support for the Northern Alternative is noted.

22-3 Based on comments by you and others, the preliminary Oil Spill Contingency Plan has been modified. These modifications are included in the Modifications and Corrections section for pages B-1 through B-66.

We have also evaluated your comment concerning oil spills in freshwater systems. In response to your concern, USEPA was interviewed in Region VI, VIII, and IX, and at the National Center for Emergency Response in New Jersey. The results of these interviews are included in Modifications and Corrections Section 3.3 for page 4-25.

LETTER 22

22-4 RECOMMENDATION: Specifications for the contingency plan to be submitted as part of the Construction and Use plan shall be included in the SEIS so they can be reviewed at this time.

22-5 RECOMMENDATION: Site specific plans shall be required for each of the largest 15 streams crossed by the pipeline. For the preferred (Northern) route these would be:

1. South Concho River
2. Colorado River
3. Pecan Bayou
4. Lampasas River
5. Leon River
6. South Basque Creek
7. Little River
8. Middle Yequa Creek
9. East Yequa Creek
10. Brazos River
11. Highland Bayou
12. Oyster Creek
13. Chocolate Bayou
14. Mutang Bayou
15. Clear Creek

Each plan shall demonstrate the technology to be used for containment and removal of the spilled oil. The plans shall specifically document the manpower, equipment and supply resources needed and show where they will be attained. Plans shall be developed for boom anchorages, containment areas, access roads, etc. where such do not exist naturally, and these shall be constructed prior to operation. These plans shall be developed by knowledgeable oil spill response personnel using personal on-site knowledge of the potential spill areas. They are not to be paper exercises using maps, aerial photographs, etc. Plans for restoration methods which avoid using heavy equipment to alter the streambed profile and plant root situation, i.e., avoid environmental modification.

Plans shall also be developed for dealing with a subsurface spill.

The plans shall include rapid explorations to detect subsurface components of a spill, maintenance of subsurface removal equipment and the availability of appropriate consultants to effectively advise.

22-6 RECOMMENDATION: The Pipeline Company shall maintain a minimum of two sets of response equipment

RESPONSE TO LETTER 22

22-4 Your comment regarding submittal of the Oil Spill Contingency Plan for review at this time is noted. Please refer to response to Comment 18-3.

22-5 Section 4.0 of the Oil Spill Contingency Plan on page B-53 of the Draft SEIS is representative of site-specific plans that would be prepared for the final Oil Spill Contingency Plan before operation. Please refer to the Modifications and Corrections section for page B-53, Table B4-1a, for a list of the sensitive areas that would be included as site-specific contingency plans in the Final Oil Spill Contingency Plan.

22-6 Based on your comment, text changes to page B-26 are included in the Modifications and Corrections Section 3.1.

LETTER 22

and supplies -- equal in size to the specialized equipment and supplies needed for the largest and next largest stream crossing responses.

This equipment shall be packaged in a manner where it can be rapidly transported to a site to be used by a local response contractor or to back up equipment initially deployed by a response contractor.

22-6 Cont. As a minimum, this response capability should include a mobile command center capable of communicating with the pipeline control center and serving as a local spill site center of communication, boom, skimmers, pumps, hoses, pipes, nozzles, adsorbents, storage devices, weedeaters, handtools, protective equipment, etc. The latter could best be stored in a series of semi-trailers at appropriate locations.

RECOMMENDATION: A ~~detached~~ detailed response manual shall be prepared which integrates state-of-the-art oil spill response methodology with the construction equipment, specialized oil spill equipment, specialized oil spill supplies and other logistical components which can realistically be expected to be used on a spill of up to 20,000 barrels at a site along this pipeline. Information presented us in Section 3.0, "Immediate Response Procedures" could be one subsection of the overall response manual.

RECOMMENDATION: I recommend you look to the other end of this pipeline to the Santa Barbara area and their Clean Seas Cooperative and Industrial Contingency Plans to find examples of effective site specific contingency planning.

To assure reasonable response preparations are made, the following recommendation is made:

22-7 RECOMMENDATION: Spills on the order of 10,000 to 20,000 barrels shall be considered as the likely largest spills to be dealt with, and that contingency planning resources should be based on spills of this size.

To assure proper leak alarm and shutdown of the pipeline will occur, the following recommendation is suggested:

22-8 RECOMMENDATION: It is recommended that at one or more locations, a suitable control system alarm, and shut-down test facility be constructed as part of the

RESPONSE TO LETTER 22

22-7 Based on your comment, text changes for page B-26 are included in the Modifications and Corrections Section 3.1.

22-8 The system recommended by your comment exceeds the industry norm for leak detection systems and for that reason has not been included in the recommended mitigation measures.

LETTER 22

22-8 Cont.

pipeline physical plant. This testing facility would consist of a T-valve in the main pipeline, necessary piping leading to a storage tank, a small heater to heat the storage contents, and the necessary pumping to return oil to the pipeline. This testing system could be used by Railroad Commission or other appropriate regulatory personnel. Regulators or company personnel could come to the test facility under appropriate control conditions, create an oil removal from the pipeline at a pre-determined test rate, and then monitor whether appropriate alarms and shut-down procedures are put into action. Such a system would serve a dual function: (1) To see if the pipeline control system truly performs as its proponents say it will, and (2) to serve as a control mechanism to assure pipeline management that their operators are adequately trained to detect and respond to alarm situations.

22-9

To assure that those who will suffer damage from spills are compensated, the following recommendation is made:

RECOMMENDATION: Liability insurance ~~of like amount~~ (ten million dollars) should be carried to cover the entire pipeline to provide for the payment of legitimate damages caused by oil spills or other activities relating to this pipeline. When, and if, the Federal Water Pollution Control Act is amended to ensure that third-party damages are covered under that act, that this requirement could be eliminated in lieu of whatever financial responsibility requirements would then be required under the Federal Water Pollution Control Act or other appropriate legislation.

22-10

And finally, the original proposal route appears to cross the Edwards Fault Zone Aquifer north of the groundwater divide. If so, negotiations reported in the SEIS regarding agreements with the Edwards Underground Water District are inappropriate.

RESPONSE TO LETTER 22

22-9 Your comment regarding liability insurance is noted. Please refer to the response to Comment 18-2.

22-10 Thank you for your comment. Based upon our analysis, your statement regarding jurisdiction of the Edwards Underground Water District appears correct.

LETTER 23

B.L.M.
Hearing on All American Pipeline Co.
Draft Environmental Statement

March 5, 1987

Dear Sirs:

First of all I want to thank the Bureau of Land Management and all that have been involved in the Environmental studys and all other work done on the investigations and all on this project between the people of Texas and the All American Pipeline Company.

23-1 I feel, like millions of other people in the area along the proposed route, that the All American Pipeline Company picked about the most hazardous and the most sensitive area of Texas to run their line. Our drinking water is one of our greatest worry. We have a good, pure water supply at this time, with our wells, springs, streams, and rivers, and I do not believe that we should take the risk of these possibly being polluted by this pipeline. I realize

23-2 that we have several other pipelines in our area, but none as hazardous as this one is to be, and I also realize that this is just <u>one</u> <u>more</u> chance of pollution. In the studies that we have made in the last year or two, we have found a shocking amount of explosions and leaks in pipelines. It is getting more common every day. There are a lot of these you

RESPONSE TO LETTER 23

23-1 Your comment regarding opposition to the Proposed Route because of potential groundwater contamination is noted.

23-2 Your comment regarding pipeline leaks is noted.

LETTER 23

23-2 Cont. people (B.L.M., etc.) probably hear about, but a lot, lot more nobody finds out about if the pipeline people can help it. Our main underground water here in the Hill Country is the Glen Rose. It feeds into the Edwards Aquifer. Therefore we feel so strong about the whole South Central Texas

23-3 Area and their water supply. We can't live without water! Any small risk is one risk to money and I don't think the pipeline accross our water supply is a <u>small</u> risk at all!

We are also concerned about our oak country, (because of oak decline) our wildlife, our clean air, and many other things.

I do not believe in shoving something off on my neighbors that I myself don't want on my property, but I think in this case there are not near

23-4 as many things involved if the route is changed. I would like to say I very much prefer a <u>No Route</u>, but if it has to go on from Ma Comey to the Texas coast, that I agree with the Bureau of Land Management report that the Northern route is the best route to take.

Sincerely yours,
Shirley Pope
Rur. Rt. Box 230
Harper, Texas 78631

RESPONSE TO LETTER 23

23-3 Your comment regarding the risk to your water supply is noted; please refer to revised Mitigation Measures GW-1 and GW-3 in Appendix A of the Final SEIS.

23-4 Your comment regarding support for the No Project Alternative is noted. Please refer to the revisions to pages 2-37 and 4-172 in the Modifications and Corrections section concerning the No Project Alternative.

LETTER 24

March 5, 1987

Bureau of Land Management
California Desert District
1695 Spruce Street
Riverside, California 92507

Gentlemen:

After having read the Environmental Statement I feel it doesn't adequately address several issues critical to our Hill Country area.

24-1 LiveOak Decline is a dreadful disease that kills the Liveoak tree that is so important to our ranching economy as feed and shelter for wildlife and domestic animals. This disease can be carried in to our area and spread completely through by the construction equipment.

24-2 Most of this area's water needs are provided by wells which are endangered by construction methods to say nothing of future oil spill pollution. There is no provision for watering wildlife and livestock if a well is caved in or the flow of water diverted by construction.

24-3 I feel either alternate route will have less environmental impact both during the construction phase and after the project is in operation.

Thanking you in advance for any consideration you may give these vital issues when making your final decision.

Sincerely,

Harry F. Wilke

Harry F. Wilke
Doss Rt. Box 420
Harper, Texas 78631

RESPONSE TO LETTER 24

24-1 Your comment regarding live oak decline is noted. Please refer to pages 3-46, 3-138, and 3-202 of the Draft SEIS for discussions of this disease, including its known and potential range of occurrence. Also refer to Mitigation Measure TB-7 for measures to be taken to reduce the potential for spreading the disease. Construction equipment decontamination is addressed in this mitigation measure.

24-2 Your comment regarding the damage to an existing water resource by an oil spill or pipeline construction is noted; please refer to revised Mitigation Measure GW-3 in Appendix A in the Final SEIS which addresses wells damaged by pipeline construction or operation.

24-3 Your comment regarding support for either the Northern or Southern Alternative is noted.

LETTER 25

[illegible]

3-5-87

All American Pipeline
Gillespie Cty., Tx.

25-1
1. Economic Impact & Costs:
Pipeline Costs - $600,000 Mi. X 40 Mi = $2.4 million
Pump Sta - Harper Area 5.0 "
Initial Impact - Food, Housing,
Supplies, Fuel, etc. 5.0 Million
$12.4 million
Loss of Employment to 100-200 People for 60 days

25-2
2. Loss to Gillespie County
Ad Valorem Taxes @ 2% x 50 yr (on 7.4 Mil.) $7.4 million
Initial Impact 5.0 million
Loss $12.4 Million

A Lot of Money

25-3
3. Causes of Loss:
A. Local, State & Federal Govt. intervention
At Local citizenry Request - Ignorance -
Money Grabbers - Lawers - in & out of Town
Unknown Facts hidden by locals, such as
outlined above - The Rape of a beleaguered
industry that wants to ease the Tax
Burden we now have, Plus Poor Local Media

25-4
4. Questions
1. How Many Pipelines cross Edwards Acquifier today

25-5
2. Why don't our city, County & state "Fathers"
Let Progress move on

RESPONSE TO LETTER 25

25-1 Your comment regarding economic impacts of the All American Pipeline has been noted. The overall economic effect of the project is described in the Draft SEIS on page 4-98, paragraphs 4, 5, and 6; page 4-99, paragraph 8; and Table 4-36 on page 4-101. A detailed discussion of economic gains or losses from pipeline construction and operation for each county is beyond the scope of the SEIS; however, the relative economic benefit for each county is described in the Draft SEIS as noted above. In general, the pipeline would provide a tax benefit, but the increase is significant only in Mills County for the Northern Alternative and Kinney County for the Southern Alternative. Employment is short-term and would use about 30 to 60 percent local workers.

25-2 Please refer to the response to Comment 25-1.

25-3 Your comment regarding support of the All American Pipeline based on its contribution to local property taxes is noted.

25-4 Data in Rose (1986) show six existing crude oil pipelines that cross the Edwards Aquifer along routes parallel to that of the All American Pipeline Proposed Route.

25-5 Your comment regarding support of the All American Pipeline along the Proposed Route is noted.

LETTER 26

Paul A. Davis
P.O. Box 247
Junction, Texas 76849
March 5, 1987

Mr. William S. Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

Thank you for the copy of the Draft Supplemental Enviromental Impact Statement regarding the proposed All American Pipeline project.

26-1 We have found this to be a very thorough and comprehensive study, and we commend your selection of the Northern Route as BLM's preferred route. We agree that this route has problems that can in a large measure be mitigated with the least amount of permanent damage.

26-2 The Proposed Route crosses several very critical areas from the Edwards Plateau to the Balcones Fault Zone. We know of areas here in Kimble County where the oil from a spill would not only flow into spring fed streams, but also down through the highly fractured limestone into the underground water supply as well. This is true of the South Llano River crossing as well as the Johnson Fork crossing East of Junction. Water from these streams is vital for ranching, wild life and irrigation purposes.

26-3 How porous is this highly fractured limestone? The Inter Tex Gas line crosses a two inch water line on our Ranch. The Gas Company replaced this crossing with plastic pipe rather than the origional iron pipe which they had removed. About five years ago, we were in the process of filling the storage tank with water. The pressure was normal at the pump, but we were not receiving any water at the tank, which is about one half mile away. We walked the line several times but found no evidence of a break. Out of desperation, we dug out the plastic pipe replacement on the Gas Line - there was our break! From a line buried approximately two feet below the surface of the ground, a two inch stream of water had been flowing for almost nine hours without one drop appearing on the surface. Suppose this had been OIL instead of WATER!

Oil from a small break in a line crossing this honey comb, highly fractured limestone might never appear on the surface and go undected until our springs, wells, and under ground water supply became a mixture of crude oil and water. Should this happen JUST ONCE the damage would be irreparable.

26-4 We know All American will install safety valves and leak detection devices, but what about the line in Alaska with all of those safety measures that had a small break and the oil flowed under the ice down the line into a river and down the river into tha Anartic Ocean before it was sighted and traced back to the source?

26-5 Should the All American Pipeline be constructed along the Proposed Route, it will prove to be the TIME BOMB which will ultimately destroy the economic viability of an entire region, and the water supply of over two million people.

This statement is based upon facts which I know to be true from ten years experience as a Pipeline Gauger, Pump Station Engineer and Pipeline District Foreman.

Respectfully submitted,

Paul A. Davis

Paul. A. Davis

RESPONSE TO LETTER 26

26-1 Your comment regarding support for the Northern Alternative is noted.

26-2 Your comment regarding the Edwards Plateau area along the Proposed Route is noted; please refer to the additional information provided on the Edwards-Trinity Plateau Aquifer in the Modifications and Corrections section for page 3-8.

Based on your comment, text changes to Table 3-1 in the Draft SEIS are included in the Modifications and Corrections section of the Final SEIS. The modification entails an addition to Table 3-1 to include; Coefficients of Transmissibility, Coefficients of Permeability Coefficients of Storage yield values for the major and minor aquifers.

Mitigation Measure SS-2 in Appendix A of the Final SEIS shows that a remote-control block valve is proposed for the South Llano River crossing. The valve will reduce the volume of oil potentially reaching the South Llano River. Impacts to flowing surface water are temporary, and water use is only briefly restricted. A site-specific Oil Spill Contingency Plan will be prepared for this crossing; please refer to the Modifications and Corrections section for page B-53.

26-3 Your comment regarding the porosity of fractured limestone is noted. According to TDWR Report 3235 (1979), the measurement of permeability in the Edwards and associated limestones is almost impossible due to the variation in porosity, which could range between 0 to greater than 50 percent, caused by solution channels, cracks, and vugs.

26-4 Your comment regarding the case of the oil spill in Alaska is noted. AAPL will follow DOT requirements.

26-5 Your comment regarding opposition to the Proposed Route based on potential groundwater contamination is noted.

LETTER 27

March 5, 1987

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

27-1 The Draft Supplemental Environmental Impact Statement for the Proposed All American Pipeline Project, dated January 1987, makes no reference to actual surface or subsurface percolation tests along the proposed pipeline route. Apparently, no percolation tests were made.

The extensive solution channel/cavity and cavernous features of the subsurface limestone/dolomite lying under the greater part of this proposed pipeline mandate a more thorough study of this sensitive area. A properly applied spectrum of percolation tests would provide information for:

- pipeline route selection.
- necessary linear changes in the pipeline path to avoid extremely sensitive subsurface features or preventive construction measures.
- containment and restoration of damage planning for pipeline spills.

27-2 The following worst-case scenario is entered to underscore the need for continued extreme vigilance in surveillance of this pipeline proposal. [A break in the All American Pipeline has occurred in a remote area of the Edwards Plateau. Most of the toxic spill poured into an undetected limestone cavity directly beneath the pipeline. Cleanup of the surface spillage was completed quickly and efficiently.....]

Truly,

William O. Alexander

Box 63A, Kerr Route
Fredericksburg, TX 78624

RESPONSE TO LETTER 27

27-1 Your comment regarding the need for percolation tests is noted; no such tests have been conducted. Please refer to revised Mitigation Measure GW-1 in Appendix A which stipulates additional hydrogeologic investigations prior to construction.

27-2 Your example of a catastrophic oil spill scenario is noted.

LETTER 28

TOM VICKERS
COUNTY JUDGE
JOHN A. LONGORIA
COMMISSIONER, PCT. 1
PAUL ELIZONDO
COMMISSIONER, PCT. 2
WALTER A. BIELSTEIN
COMMISSIONER, PCT. 3
BOB LEE
COMMISSIONER, PCT. 4

BEXAR COUNTY COMMISSIONERS COURT
COURTHOUSE
SAN ANTONIO, TEXAS 78205

Routing	Date	Initls.
TO:		
Action by:		
Return To:		

March 5, 1987

Bureau of Land Management
1695 Spruce Street
Riverside, California

ATTENTION: Proposed All American Pipeline Route

The Commissioner's Court of Bexar County, Texas unanimously passed the attached resolution relevant to the route of the proposed Celeron Company's All American Pipeline today and requested I send the resolution to you. Note that the Court in comparing the three proposed routes, asks that you approve only the northerly route, see attached map.

28-1 Bexar County contains just under 1,000,000 inhabitants, the vast majority of which depend on their drinking water from the Edward's Underground Aquifer. The northern route does not pass over this valuable resource, but the two other route's do, and could potentially lead to contamination.

Sincerely,

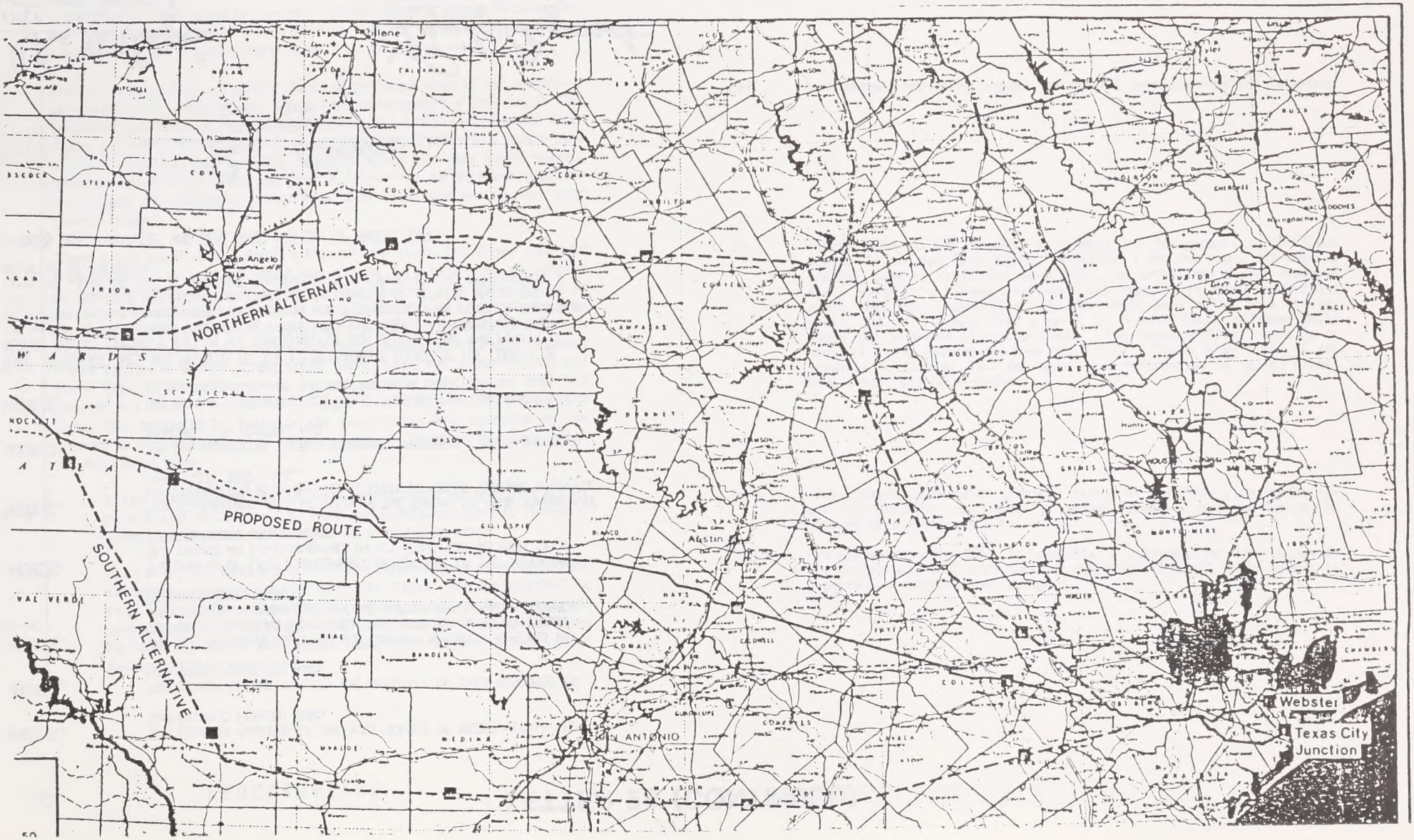
ED. H. NABERHAUS
Assistant Administrator
Commissioners Court

EHN/paz

cc: Commissioner Elizondo
Mr. Bill Holchak

RESPONSE TO LETTER 28

28-1 Your comment regarding support for the Northern Alternative based on potential groundwater contamination of the Edwards Aquifer by the Proposed Route is noted.


NORTHERN ALTERNATIVE
PROPOSED ROUTE
SOUTHERN ALTERNATIVE
San Angelo
Austin
SAN ANTONIO
Webster
Texas City
Junction

PROCLAMATION

WHEREAS, THE EDWARDS AQUIFER IS THE SOLE SOURCE OF WATER WITHIN THE SAN ANTONIO REGION; AND,

WHEREAS, PROTECTION OF THE QUALITY AND QUANTITY OF THIS RESOURCE IS OF UTMOST PRIORITY; AND,

WHEREAS, THE ALL-AMERICAN OIL PIPELINE COMPANY RECENTLY APPLIED TO THE TEXAS RAILROAD COMMISSION FOR PERMISSION TO CONSTRUCT A HYDROCARBON TRANSMISSION LINE ACROSS THE EDWARDS AQUIFER RECHARGE ZONE; AND,

WHEREAS, THE BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR, HAS ISSUED AN ENVIRONMENTAL IMPACT STATEMENT AS PART OF A FEDERAL COURT ORDER; AND,

WHEREAS, PUBLIC HEARINGS WILL BE HELD BY THE BUREAU OF LAND MANAGEMENT IN COOPERATION WITH THE TEXAS STATE ATTORNEY-GENERAL'S OFFICE FROM 2-17, 1987; AND,

WHEREAS, THE ENVIRONMENTAL IMPACT STATEMENT PRESENTS THREE PROPOSED TRANSMISSION ROUTES; AND,

WHEREAS, TWO OF THE PROPOSED LINES CROSS THE AQUIFER, AND ONE ROUTE IS PROPOSED NORTH OF THE AQUIFER NEAR WACO;

NOW, THEREFORE, WE, THE MEMBERS OF THE COMMISSIONERS COURT OF THE COUNTY OF BEXAR, HEREBY STRONGLY INFORM ALL CONCERNED OF OUR DESIRE THAT THE PURITY OF THE WATER IN THE EDWARDS AQUIFER BE PROTECTED, AND FURTHER EXPRESS OUR ONLY PREFERENCE THAT THE NORTHERN TRANSMISSION ROUTE BE CHOSEN. WE FURTHER STRONGLY URGE THAT THE MOST STRINGENT CONSTRUCTION SAFEGUARDS BE APPLIED WHILE THE PIPELINE IS BEING BUILT, AND THAT CONTINUOUS MONITORING BY THE APPROPRIATE AGENCIES BE ENFORCED.

WITNESS OUR SIGNATURES AND SEAL THIS 4TH DAY OF MARCH, 1987.

Tom Vickers
TOM VICKERS
COUNTY JUDGE

John A. Longoria
JOHN A. LONGORIA
COMMISSIONER, PRECINCT 1

Paul Elizondo
PAUL ELIZONDO
COMMISSIONER, PRECINCT 2

Walter A. Bielstein
WALTER A. BIELSTEIN
COMMISSIONER, PRECINCT 3

Bob Lee
BOB LEE
COMMISSIONER, PRECINCT 4

LETTER 29

STATEMENT REGARDING ALL-AMERICAN PIPELINE
BY
RICHARD CRISP, CITY COUNCILMAN, SAN ANGELO, TEXAS

My name is Richard Crisp. I am representing the City Council of San Angelo at this meeting tonight. Personally I am in the gas pipeline business and that is the reason I was asked to represent the City Council. We appreciate your having this meeting in our city regarding the All American pipeline. This pipeline has stirred much interest in the state and in our city.

29-1 The City Council of San Angelo is aware of the importance of the petroleum industry in West Texas and its impact upon the economy of San Angelo. The Council is aware that there are many thousands of miles of pipelines in West Texas that carry oil, gas, and petroleum products. We are also aware that many of these pipelines are large diameter, steel pipelines which operate under pressures in the range you plan to operate the All American pipeline. We support the petroleum industry in West Texas and we support your pipeline project.

29-2 There is one aspect of the pipeline that we are vitally concerned with and want to discuss our concerns with you tonight. As I have said, we support the petroleum industry, but there is an area that we must consider just as important - that is the protection of our drinking water. I have studied the maps showing the route of your proposed pipeline and noticed that it crosses nearly every one of the streams and rivers which provide San Angelo's water supply. It crosses Spring Creek, Dove Creek, the South Concho, and Pecan Creek. The pipeline even crosses many of the streams that will provide San Angelo's future water supply from Stacy Reservoir. We must insist that measures be taken in the construction and operation of the pipeline to insure the safety of our water supply. There are four things that we must insist upon:

29-3 1. The pipeline must be built with proper materials and with proper construction techniques. The state and federal agencies in charge of inspection must make certain that these things are done.

29-4 2. At every live stream and river, the pipeline must have valves and automatic, pressure-sensitive shut-offs. These must be installed on each side of the river. These pressure sensitive devices should automatically shut-off in the event that pressure losses are detected on the stream side of the pipeline. Using these devices, we believe that any spills will be minimized.

RESPONSE TO LETTER 29

29-1 Your comment regarding support for the All American Pipeline is noted.

29-2 Please refer to the response to Comment 6-4 for impacts to the South Concho River and Twin Buttes Reservoir. The Northern Alternative crosses several drainages which will be tributary to the proposed Stacy Reservoir. These drainages are crossed in their headwaters where they are intermittent and currently many miles from flowing water. It is unlikely that a spill in or near these drainages would reach the proposed Stacy Reservoir. The Colorado River crossing is about 3 miles downstream from Stacy Dam. Please also refer to the response to Comment 39-1 for additional information on Spring Creek, Dove Creek, and Pecan Creek.

29-3 Your comment concerning technical review of the final pipeline design and construction compliance is noted; please refer to Mitigation Measure SS-3 in Appendix A.

29-4 Mitigation Measure SS-2 in Appendix A provides for the suggested protection at river crossings at which an oil spill would result in significant environmental damage.

LETTER 29

29-5 3. A regular maintenance program must be maintained by the pipeline company on the pressure sensing devices. The devices must be tested and maintained on a regular basis so that these regulators will function properly in case of emergencies. Cathodic protection is vital to insure the strength and integrity of the pipeline. This must be adequately provided and properly maintained. I have seen gas pipelines that were losing nearly half of their gas each day to leaks caused by corrosion.

29-6 4. We hope there will never be any problems with the pipeline. We hope there will never be any earthquakes or other disasters which could rupture the pipeline. In the event of such problems, the company must station emergency crews in this area to rush to the problem site immediately. The emergency crews must be trained and have proper equipment to deal with any emergency and protect our water supply.

In conclusion, we support the petroleum industry and we support this pipeline. We insist that the pipeline have the protective devices, the maintenance, and the emergency crews that will be needed to assure the protection of the drinking water for San Angelo.

RESPONSE TO LETTER 29

29-5 DOT requires testing of protective devices at least once per year. In practice testing is done more often, especially if normal system checkout indicates a problem exists. Devices are checked against known quantities using mechanical and electronic devices. All American will follow DOT requirements specified in 49 CFR Part 195 for maintaining the cathodic protection system, including testing for the adequacy of the cathodic protection at 12-month intervals.

29-6 Your comment regarding oil spill contingency planning is noted. Please see the response to Comment 18-3 and Mitigation Measure SS-1 in Appendix A.

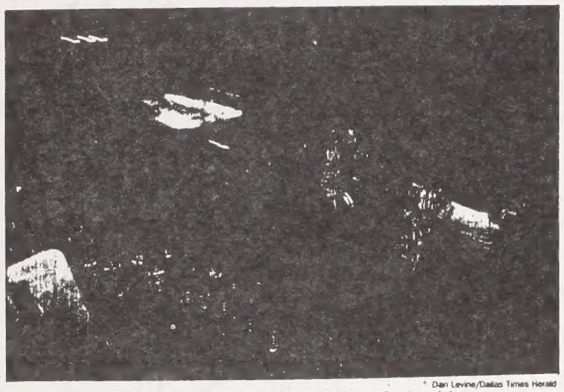
.: The Association of Retarded Citizens needs volunteers for adult classes this spring (634-9810).

Dallas Times Herald

Tuesday, March 3, 1987

DALLAS/TEXAS B

Submitted by:
Rick L. McGee M.D.
1302 Shafter
San Angelo, TX 76901



Dan Levine/Dallas Times Herald

Volunteers distribute bottled water to Mineral Wells residents Sunday night.

Mineral Wells copes with foul water

By Nora Zamichow
OF THE TIMES HERALD STAFF

MINERAL WELLS — Many customers at the city's Water Utilities office Monday teased clerk Donnita Glover about having to pay for their gas along with the water.

Despite enduring their second day without tap water, residents were good-humored about the inconvenience caused by a gasoline pipeline leak that contaminated a tributary from which the city draws its drinking water.

"It hasn't bent me out of shape any," said Susan Wallace, 29, a kindergarten teacher at Lamar Elementary School. "It's not been so bad — in fact, you could say that this is about the biggest thing that has happened in Mineral Wells."

In the small town west of Fort Worth, where pickup trucks are popular and livestock graze on tawny slopes nearby, the 16,000 residents adjusted to life without tap water. An official of Chevron Pipe Line Co., which owns the 30-year-old pipeline, said it would take at least until Wednesday to flush the water system of gasoline.

For the past two days residents have lined up for blocks to obtain bottled water from the town armory where more than 30,000 gallons were distributed. Some people stopped cooking and ate out. Restaurant managers scrambled to stock up on soda and ice.

Chad Phillips, a representative for a company selling water filters that screen contaminants, handedbrochures to people who had just picked up jugs of untainted water.

"It's a golden opportunity," said Phillips of National Safety Associates Inc. "People will finally be aware that they are drinking a lot of chemicals."

Many residents took the situation in stride.

"I imagine we'll be hauling water till we can't smell gasoline in it," said Martha Mitchell, who waited 20 minutes to pick up three gallons of bottled water from the armory Monday afternoon. "It's just an accident — there's nothing they can do and there's no one to be mad at."

A section of a 512-mile pipeline owned by Chevron leaked about 16,800 gallons of gasoline Friday into Little Sunday Creek, contaminating the city's major public water supply. The problem, first spotted by a dispatcher in the company's Houston office, was traced to Mineral Wells on Saturday, prompting city officials to caution residents not to consume tap water until tests determine whether it was safe.

Officials continued testing Monday. City Manager Sam Phelps and Chevron officials, however, do not believe the tainted water endangers consumers.

"It's highly unlikely that anyone will be medically affected from the water," said Jim Nuckols, Chevron's environmental specialist. He said the company suggested a ban on drinking water "because we can't afford to play with anyone's life."

Officials said residents are abiding by the ban.

Please see **WATER, B-3**

WATER

From B-1

"I was most concerned about shut-ins — invalids and elderly," said Police Chief Don Farrell. He said that 90 five-gallon bottles of water were delivered by the fire department to those who were unable to get it for themselves.

Restaurants seem to be hit the hardest by the water crisis, Phelps said.

Managers at McDonald's and Pizza Hut said they are unable to operate their soda machines — which use water and syrup to produce drinks — as well as coffee makers and juice mixers. At both restaurants, employees were sent to local stores to buy soda and ice.

"It's been quite an adjustment," said David Williams, manager of McDonald's. "It's a real mess, but we don't want to close down."

Many, including Phelps, are philosophical about the town's plight.

"You stop to think how many of these pipelines there are through the state of Texas, and it's a wonder there's not more of this," Phelps said. "It's just part of doing business."

2-83

LETTER 30

illiam Haigh
ureau of Land Management
verside Calif 92507

30-1 [im John A. & Fair Rt 1, Box 39 Cameron Tex 76520
im 58 yrs old. married and have 1 daughter and
m engaged in farming and carpenter work
own 2.50 acres of land 1 mi west of Cameron
which is in the Wilcox aquifer which is
located approximately 1 1/2 mi. North of the
proposed pipeline and 4 mi. East of Pump Station
#5 where I have lived all my life 58 yrs. I am
opposed to the northern route because of the potential
pollution of the aquifer by an oil spill, on
which many people depend for their water
supply. myself included. I have a well on my
place that is nearly 100 yrs. in use, I have
the honor of using the water from this well
for 58 yrs. and I hope my family has the
use of this well for a long time

30-2 I am also concerned about the property
rights of the people, the pipeline will cross
They have not been informed that their
land is being considered for use by the
pipe line Co.

30-3 I have not found anywhere in the Environment
Impact statement where the pipe line company
proved that it needed to build a pipe line
and infringe on the rights of people to no own
... the right to decide what

RESPONSE TO LETTER 30

30-1 Your comment regarding opposition to the Northern Alternative because of potential groundwater contamination of the Wilcox Aquifer is noted. Supplemental information on the Carrizo-Wilcox Aquifer has been added to the Final SEIS; please refer to the Modifications and Corrections section for pages 3-114 and 4-113.

The Northern Alternative crosses the Carrizo-Wilcox Aquifer in Milam and Burleson Counties. This aquifer is overlain by 9 to 75 feet of Brazos River alluvium along portions of the Northern Alternative. The Carrizo-Wilcox water supplies that may be affected by an oil spill include the Cities of Rockdale and Minerva as well as domestic and livestock wells along this route. Very shallow wells in the Brazos River alluvium or other thin alluvial deposits along the route could also be affected. The shallow depth to groundwater (30 to 75 feet) and high degree of groundwater use make the recharge zone of this aquifer sensitive to oil spill impacts. The confined down dip portion of the aquifer would not be affected by oil spills.

Subsurface oil spill migration and behavior in the granular aquifer is more predictable and more easily mitigated than in fractured limestone aquifers. Therefore, a smaller area is likely to be affected during the time between a spill event and implementation of cleanup measures. Please refer to the Modifications and Corrections section for Appendix A, Sections 1.1 through 1.4, for detailed discussions on crude properties and behavior. Section 1.5 of the same appendix discusses threshold spill sizes for polluting the Carrizo-Wilcox Aquifer based on health criteria as well as taste and odor criteria.

Mitigation Measure GW-1 in Appendix A of the Final SEIS indicates that detailed hydrologic investigations will be conducted along the selected route prior to construction. Measures GW-2 and GW-3 delineate steps that will be taken in the event of an oil spill.

30-2 Should the Northern Alternative be selected by the BLM and should AAPL choose to pursue their project along that alignment, each property owner would be notified and negotiations undertaken relative to receiving compensation for the pipeline ROW across their property. This will not be done until after the final ROW alignment has been identified by AAPL.

30-3 Your comment regarding project need is noted. Please refer to the Draft SEIS and the Modifications and Corrections section for pages 3-93 through 3-107 for a discussion of economic supply and demand of West Coast crude oil.

LETTER 30

30-3 Cont. They want to do with their land. I refer to a article in the Jungle Daily Telegram dated March 8, 1987 which I have attached showing there is no need for the proposed pipe line.

30-4 There are 3 proposed routes being discussed but I think the 4th route should be considered very carefully and that is "NO ROUTE"

RESPONSE TO LETTER 30

30-4 Your comment regarding support of the No Project Alternative is noted. Please refer to the Modifications and Corrections section for pages 2-46 and 4-172 .

TEMPLE DAILY TELEGRAM
TEMPLE TEX
MAR 8, 1987

Pipeline Almost Ready But Lacks Customers

BAKERSFIELD, Calif. (AP) — The nation's longest oil pipeline soon will be ready for business, but producers of California's cheap, heavy crude haven't yet signed up to use it.

The $1.2 billion pipeline was built across the Southwest on the premise that an anticipated glut of West Coast heavy crude would be able to compete in East Coast and Midwest markets.

But an expansion of offshore production has been delayed by environmental controversy, and inland producers are wary because of the collapse of oil prices.

"Made It Too Early"

"We went from being the pipeline that couldn't make it in time, to the one that made it too early," said Louis J. Resweber, spokesman for Celeron Oil Co., the nation's third largest independent oil company in terms of reserves, with 153 million barrels.

Its 1,225-mile underground All American Pipeline stretches from the Pacific Coast near Santa Barbara to McCamey, Texas, where it connects with other pipelines, allowing oil to move on to Gulf Coast refineries.

The All American Pipeline is twice the length of the Trans-Alaskan Pipeline. It has a capacity to carry 300,000 barrels a day and is the first oil pipeline from the Pacific Coast to the Gulf Coast.

"This is something people have dreamed about for a century," said Steve Berg-Hansen, an oil industry expert formerly with the California Independent Producers Association.

Open Competition

Berg-Hansen thinks the pipeline will open competition between California petroleum and imported heavy crude from Mexico and Venezuela. It also could compete to a lesser extent with West Texas oil, he says.

But many producers are cautious when discussing the line's value.

They are concerned because of the continuing worldwide oil slump, an unresolved per-barrel shipping tariff, questions about timely delivery and the several years' delay in a major expansion of production off California's coast as a result of of environmental controversy.

Goodyear Seeks Buyer

Celeron has been a subsidiary of Goodyear Tire and Rubber Co. since 1983, but Goodyear has been seeking a buyer for the energy operation so it can concentrate on the tire business. The decision was part of a restructuring plan undertaken by Goodyear to fend off a takeover attempt by Sir James Goldsmith, an Anglo-French financier who held 11.5 percent of Goodyear's common stock.

Celeron officials said they intentionally did not seek advance commitments for use of the pipeline, which is contrary to standard industry practice.

"It's just the strangest way I've ever seen to build a pipeline," said Robert Walsh of Chevron USA, adding that his company has no plans to use the pipeline because it does not expect to have a surplus of heavy crude.

"Major Risk"

"They've taken on a major risk and with the scheme of things in the depressed world oil market, it's hard to figure out where they're going to get their first oil other than from themselves," Walsh added.

California's heavy crude generally sells for $3 to $5 a barrel less than lighter West Texas Intermediate, the U.S. benchmark that currently is selling for $16 to $17. The heavier the crude, the more it must be used for heating and fuel oil and other less profitable petroleum-based products.

Robert Mercer, Goodyear's chief executive, told reporters last year the pipeline needed to carry only 100,000 barrels a day to break even, as long as prices are $15 a barrel or more.

The pipeline was conceived when U.S. oil prices averaged $22.

Using its own oil, Celeron will start filling its pipeline in April. It will be ready to accept shipments from others by summer.

Obit

Nettie M. Haney

GEORGETOWN — Services for Nettie M. Haney, 91, of Georgetown and formerly of Belton will be at 2 p.m. Monday at the Davis Funeral Home in Georgetown with Dr. Leroy Kemp officiating.

Burial will be in I.O.O.F. Cemetery in Georgetown. Mrs. Haney died Friday in a Georgetown hospital.

She was born in Milam County, the daughter of Martha Fletcher and Thomas F. Guthrie.

Survivors are three daughters, Lois M. Haney of Georgetown, Lola Haney Saski of Belton and Mildred Haney Norment of Georgetown; three brothers, Buddy Guthrie of Florence, Nolan Guthrie of Rock Springs and Arnold Guthrie of Louisiana; three sisters, Mrs. Frank Hausenfluck, Clara Williams and Mrs. Alton Carter, all of Georgetown; four grandchildren; and six great-grandchildren.

Chong Pak

KILLEEN — Chong Pak, 19 of Killeen died Saturday night in a traffic accident in Killeen. Funeral arrangements are pending with Harper-Talasek Funeral Home of Killeen.

Garland Brown

SALADO — Services for Garland L. Brown, 74, of Salado will be at 2 p.m. Monday in the Salado Methodist Church with the Rev. Joe Bentley officiating. Burial will be in the Salado Cemetery.

Brown died Saturday morning at his home. He was born in Milam County to Grady and Abbie Brown. He served as a staff sergeant in the U.S. Army Air Corp during World War II and received the Bronze Star for Meritorious Service. He worked for the Temple Daily Telegram, Waco Tribune and the Dallas Times Herald as a stereotyper. He had lived in Salado since 1979.

Survivors include his widow, Boots Brown; one son, James R.

LETTER 31

Commissioners
PRECINCT 1
MIKE DOLAN
PRECINCT 2
ORLIE WOLFENBARGER

Commissioners
PRECINCT 3
STEVE ELKINS
PRECINCT 4
GARY L. McGehee

PHONE (915) 835-4361

Commissioners Court
P O BOX 770
MERTZON, TEXAS 76941

March 9, 1987

United States Department of Interior
Bureau of Land Management
Attn: William Haigh
1695 Spruce Street
Riverside, California 92507

RE: All American Pipeline Project;
Favoralbe Recommendation of
Irion County Commissioners Court
of Northern Alternative Route.

Gentlemen:

31-1 We, the undersigned Commissioners Court of Irion County, Texas, a county transited by the Northern Alternative Route of the All American Pipeline, do hereby submit our favorable recommendation of the Northern Alternative Route, and we hereby wholeheartedly solicit the favorable recommendation of said pipeline by all affected counties of West Texas and the State of Texas for the following reasons:

31-2 Tax Base: In a period of declining tax base due the the declining oil prices, the addition of the real and tangible personal property of the All American Pipeline will have a positive effect on the tax base and revenues of Irion and other counties of transit.

31-3 Employment: In a period of declining employment due to the decline of the oil industry, the All American Pipeline will provide valuable employment for residents of West Texas and Irion County.

RESPONSE TO LETTER 31

31-1 Your comment regarding support for the Northern Alternative is noted.

31-2 Your comment regarding the positive effect of the All American Pipeline on the tax base, revenues, and employment in Irion County has been noted.

31-3 Please refer to the response to Comment 31-2.

LETTER 31

31-4 Safety: By construction of a new pipeline, which will be much safer than the use of older depreciated pipelines, the safety aspect will be improved and the potential for any adverse environmental impact will be reduced.

Again, we wholeheartedly recommend the acceptance of the Northern Alternative Route of the All American Pipeline for the above stated reasons.

Respectively Submitted,

James D. Westfall, County Judge

Mike Dolan, Commissioner Precinct #1

Orlie Wolfenbarger, Commissioner Precinct #2

Steve Elkins, Commissioner Precinct #3

Gary McGeHee, Commissioner Precinct #4

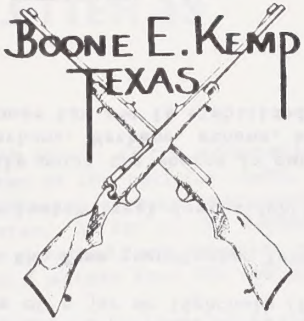
Page -2- of -2-

RESPONSE TO LETTER 31

31-4 Your comment regarding support of the proposed pipeline based on safety is noted. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172 for statistics relating to the increased risk associated with the existing common carrier pipelines.

LETTER 32

BOONE E. KEMP
TEXAS



9 March 1987

U.S. Bureau of Land Management
1695 Spruce
Riverside, Ca. 72507

Dear Sir:

2-89

32-1 I wish to voice my objection to the proposed All American Hot Oil Pipeline from California to the Texas Coast in its entirety but Especially the proposed route across the Edwards Aquifer area so vital to the Austin and surrounding area.

Your consideration in our health and welfare is earnestly requested in the matter.

Sincerely,
Boone E. Kemp
4603 Kiowa Pass
Austin, Tx 78745

RESPONSE TO LETTER 32

32-1 Your comment regarding opposition to the Proposed Route based on potential groundwater contamination of the Edwards Aquifer is noted.

LETTER 33

March 10, 1987
4701 Ramsey Avenue
Austin, Texas 78756

Memorandum To: Mr. Robert F. Burford
Department of the Interior
Bureau of Land Management
18th and C Streets, NW
Washington, D.C. 20240

From: Earl Ingerson
GEO 208A
The University of Texas at Austin

Subject: Rerouting of Pipeline over the Edwards Aquifer.

I attended the meeting on March 2, 1987, at the Thompson Conference Center, U.T.A. where the above subject was discussed. I was disappointed that the talks were based almost entirely on emotion and prejudice. Nobody attempted to explain how the aquifer could be polluted by a petroleum "spill".

At a similar meeting at San Marcos, Texas, on August 25, 1986, I gave a paper indicating that it is probably impossible for an oil spill to pollute an aquifer.

Rather than repeat what I said there, which is presumably on record, I should prefer to call attention to an article I have found in the meantime, which approaches the problem both theoretically and experimentally, and is illustrated by diagrams in agreement with the ones I submitted last August. The article is by Fredrich Schwille, hydrologist for the city of Koblenz, West Germany. It is on pages 23-54 of a little book, The Joint Problems of Oil and Water Industries, edited by Peter Hipple and published by the Institute of Petroleum, London.

33-1

Three figures are reproduced here, numbered as they were in the publication. Figures 2 and 3 illustrate the downward motion of the oil as envisioned theoretically. It starts under the force of gravity, but as it moves into the porous soil some oil moves laterally by capillary action and the oil assumes the shape of a jar or lightbulb (Fig. 2).

When the oil reaches the free groundwater level it does two things:

1) Pushes the groundwater level down slightly, and

2) Spreads laterally until the source is cut off and/or when the lighter hydrocarbons, Methane, ethane, etc., have left the mass, which then becomes tar and is stabilized.

RESPONSE TO LETTER 33

33-1 Thank you for commenting. The information you supplied concerning the mechanics of oil spill contamination to a porous aquifer is noted. Please refer to the discussion of crude oil properties and behavior in Modifications and Corrections Section 3.3 for Appendix A.

LETTER 33

33-1 Cont.

Figure 3, lower part which shows: a) the evaporation of the lighter hydrocarbons into the pores of the soil (or rock), and eventually into the atmosphere, and b) the diffusion of very small bits of non-hydrocarbons into the uppermost layer of water. So far as the author knows these small particles have never been detected, and Schwille suggests they would not be detectable more than 4 or 5 meters from the end of the hydrocarbon "edge".

When the tar has solidified by lowering temperature and loss of volatiles the small particles can no longer escape. Since they have never been detected in the water it is self evident that they do not "pollute" the aquifer.

Schwille was not satisfied with this theoretical analysis, so he designed experiments to check the above statements, see his Fig. 11 on p. 42 of the book, which is reproduced here, with the pertinent text on the same page (from pp. 42-43 of the book).

The cross-section, of course, is not as symmetrical or smooth as in the previous idealized figures. However, it has some very interesting features not present in Figures 2 and 3:

a) The free groundwater level is nowhere depressed.

b) Only one little "finger" of the descending oil even touches the water; see the extreme left of the third diagram from the top of Fig. 11. Schwille gives a tentative explanation -- "the oil -- seems to prefer the part of the capillary fringe that has a water saturation of about 75-80 per cent". Another possibility might be that air in the pores may have been pushed downward by the oil and concentrated between the two liquids.

33-2 With no chance of contamination of the water, the arguments for adding 15% ± to the length of the last stretch of the pipeline must be based on something else. I have gone through the two massive tomes (BLM, Jan., 1987) and they seem to place emphasis on the numbers and kinds of species of the flora and fauna that might be threatened along the different routes.

33-3 The last big spill was 2300 bbl. of petroleum from a Shell pipeline in Travis County, over the Edwards Aquifer. (see enclosed discription of the spill.) The spill covered about six acres, but not completely. It did not get even close to the water level of the aquifer. What was not recovered solidified in a realitively few days and the only "damage" was to some of the surface vegetation. Historically, there have been literally thousands of spills with volumes of over 1000 bbl. each and none of these spills polluted groundwater soruces!

33-4 It is difficult to imagine that an area of six acres, mentioned above as the size of a large spill, would endanger any entire species. If there is any such place near any pipeline the life therein should be protected by dikes and fences, but I doubt that such an area exists in Texas!

33-5 Actually, the cost of a new route would probably exceed the 15% increase in length and increases time and money. New rights-of-way would have to be acquired, new plans made, etc. The southern one might be the most costly because of unfavorable topography, but better farm land, more populous areas,

RESPONSE TO LETTER 33

33-2 Please refer to the response to Comment 20-5 for a discussion of the Agency Preferred Alternative. The comparison of impacts for the alternatives considered all resources; please refer to revised Table 2-12 in Modifications and Corrections Section 3.2.

33-3 Your comment regarding the Shell Pipeline spill in Travis County, Texas is noted. As of May 1987, hydrocarbons were detected in groundwater from well #5 (in the perched zone) with a water level of 33 feet. No other contamination was detected. However, the site investigation was still ongoing as of that date. Please refer to the Modifications and Corrections section for page 4-23 for more detail.

33-4 We agree that the likelihood of an oil spill affecting all members of any species is very remote; however, the SEIS analysis has examined select remote catastrophic possibilities, and any loss of an endangered species would be considered significant.

33-5 Your comment regarding support for the Proposed Route based on the additional costs of the Northern Alternative or the Southern Alternative is noted.

LETTER 33

proximity to towns and cities, etc., might raise the cost of the northern route even more. Perhaps, if nothing else, the bugaboo of starting over again would produce "two strikes" on either new route to being with!

33-5 Cont. Everything considered, I am convinced that the original route should be reviewed, followed, and completed as expeditiously as possible. If we wait until everybody agrees it will never be done. I believe that a majority will agree that the items above make sense, are rational and viable.

Every day that we delay, every "new" study and report done will increase the eventual cost in both time and money!

Very sincerely yours,

Earl Ingerson
Professor Emeritus, Geology
The University of Texas at Austin

EI/bk

Dr. William L. Fisher suggests that I send copies of my resumé and bibliography with the letter, to bolster up my "credibility". I do not know whether they will do any good, but copies are enclosed!

cc: Mr. Wm. S. Haigh, BLM, Riverside, CA
Mr. Don C. Draper, E.P.A., Dallas
Environmental Protection Agency

RESPONSE TO LETTER 33

LETTER 33 (CONTINUED)

OUTLINE OF WHAT ACTUALLY HAPPENED WHEN THERE WAS A "SPILL" OF PETROLEUM OF CONSIDERABLE SIZE (2300 barrels) over the aquifer.

The Shell Rancho 24 inch pipeline was ruptured in Travis County (May, 1986). The following observations and information was acquired by Tony Dieste: (1) pump stations are located 50 miles upstream and 30 miles downstream from the break; (2) it took 4 minutes to shut down the line after the; (3) approximately 2300 barrels of crude were spilled over about 6 acres; and (4) about 1650 barrels of oil have been recovered; (5) the pipeline was transporting between 300,000 and 350, 000 barrels per day at the time of the break. In addition there has been no reported contamination of the Edwards Aquifer or movement of oil from the containment pits to this date (June 10, 1986).

In testimony to the Committee on Environmental Affairs: Subcommitted Hearings RE Oil Pipeline Leaks P.R. Rose noted that pipeline spills in Texas decreased from 1970 in 1975 to 736 in 1984. This decrease in frequency of spills may reflect advances in technology and increased concern about pollution.

Rose stated that any spill greater than about 1000 barrels of oil has the potential to pollute the Edwards aquifers. However, almost 70 percent of the net petroleum lost in above mentioned spills was from spills greater than 1000 barrels and yet these spills did not# result in pollution of the Edwards.

Rose also mentioned examples where pipeline spills could potentially cause ground water pollution in the "upper parts of the water-saturated zone and subsequently in springs".* These examples suggest that an "upper saturated zone" would probably prevent oil from penetrating to the underlying Edwards Aquifer thus localizing any potential pollution.

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*Even in this case there would be no pollution in the "upper saturated zone" because the solubility of petroleum in water is only a few parts per million (15± p.p.m.). Therefore, the oil would "ride" the water into a creek and/or river and would be carried away with no damage to any water supply, or to life,-even the fish would never know that the oil "smear" had come and gone!

#Indeed the oil cannot polute the water, because the two liquids are immiscible. See figs. 2 & 3 showing what actually happens when oil does get down to the top of the water in an aquifer.

Further specialized terms are required for the unambiguous and concise description of the oil migration. In the course of our outline of the migration process, we will propose some terms. The migration of oil involves three phases (Fig 2):

(*a*) Seepage—a principally downward vertical movement of oil in the unsaturated pore space;

(*b*) Lateral spread—(active) migration along the border between the unsaturated and the saturated pore space or on stratum surfaces, mainly horizontally; and

(*c*) Drift—the passive movement, on the ground-water surface, of the body of oil which is still spreading, or has already attained its maximum lateral extent.

There are all kinds of transitional stages between these phases. During the seepage period, the oil moves under the influence not only of gravitation but also of capillary forces in all directions. Therefore, a zone develops around the core of the infiltration body which can be compared with the capillary

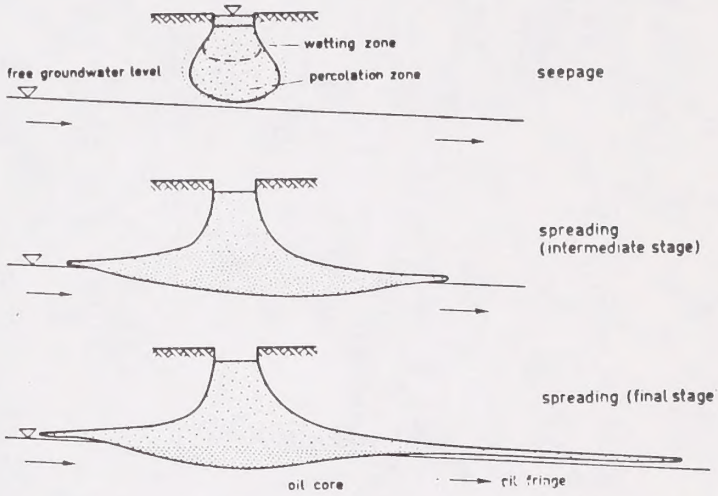

FIG 2. The spreading of oil in a porous medium (schematically)

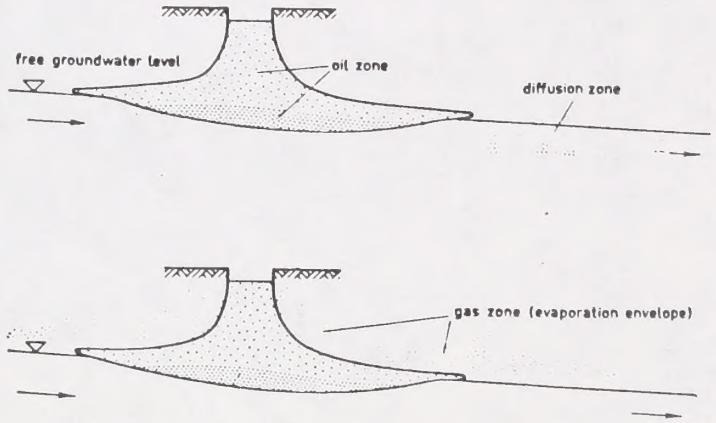

FIG 3. The distribution of oil, dissolved and gaseous hydrocarbons in a porous medium (schematically)

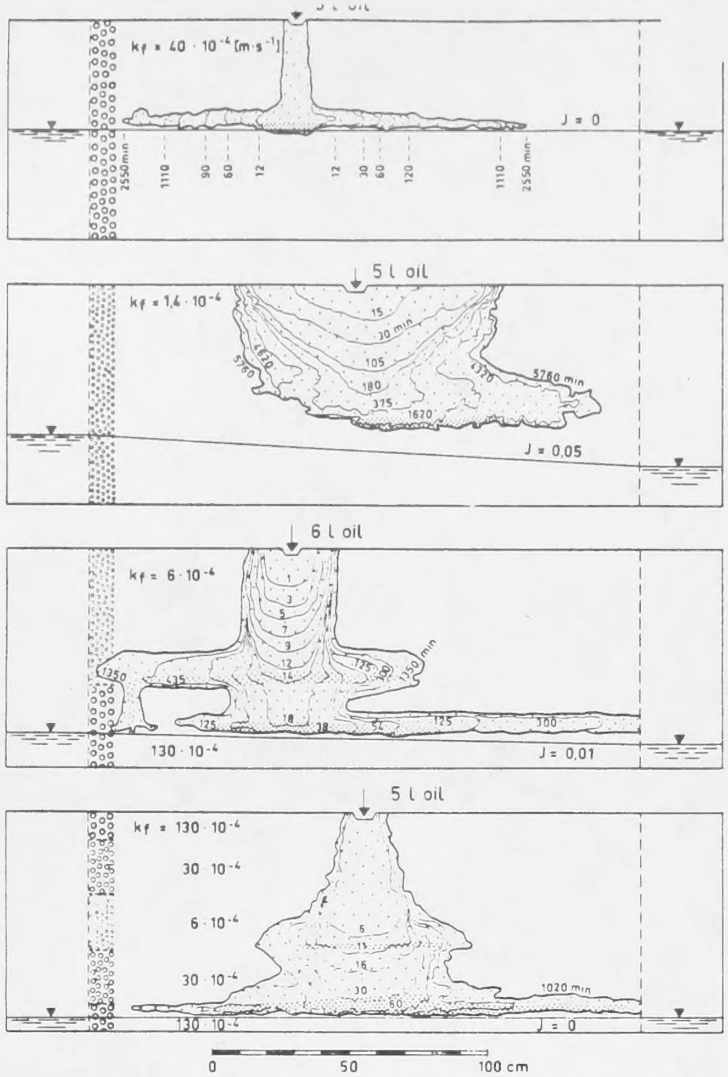

FIG 11. Model experiments: Seepage and spreading of heating oil EL in a porous medium. (Upper two figures: one layer; other two figures: more than one layer)

MODEL EXPERIMENTS ON INFILTRATION OF OIL

Model experiments can be useful for studying the mechanism of oil spread in its dependence on the physical parameters of the porous medium. We will not discuss the methods used but only submit a few results which may help to clarify what has been said so far.

The experiments were carried out in troughs with glass walls and the oil spread was observed with uv light. The hydraulic conductivity k_f of the sands to water was between 10^{-2} and 10^{-4} (m/s). This corresponds to the conductivity found in the most widely used aquifers. EL fuel oil was selected as a typical oil product (density 0·83 g/cm³, kin visc 4·0 cS at 20°C, surface tension 26·0 dyne/cm).

In preliminary experiments various oils were fed on to the free water surface of a trough 4·0 m long and 0·5 m wide and the dependence of the run-out distance on the run-out time was determined. The graph (Fig 10) shows that, with small initial thicknesses, the viscosity of the oil is only of secondary importance for the run-out. EL fuel oil is therefore a suitable representative of low viscosity oils.

Fig 11 gives the results of spread experiments in a model trough (2·6 by 0·2 by 0·8 m) filled with sand. Under the influence of gravitation, the oil seeps down to the capillary fringe and spreads in this fringe more or less horizontally. Depending on the permeability and capillarity, as well as on the rate of infiltration, the body of oil in the seepage zone will be narrower or wider, while the body of lateral spread in the capillary fringe will be thinner or thicker. If the ground water is immobile ($J=0$), the spread in the capillary fringe will, as a rule, proceed symmetrically. If the ground water

flows, it will, depending on the permeability and ground-water gradient, tend to move in the direction of this gradient.

In homogeneous media the oil will be fairly uniformly distributed in the seepage zone. Only at the base of the central part of the spread body is there a substantially higher oil concentration ("oil core"). In stratified media higher oil contents have been measured at the boundary between the less permeable and the more permeable layers. This observation, which confirms field experience, is significant because the fluviatile and fluvioglacial deposits, which are particularly important for water supply, usually consist of numerous layers with different permeabilities.

In highly permeable media, in which the height of the capillary fringe is relatively low and the rate of migration relatively high, the oil can penetrate to a level just below the zero pressure level.

But as it spreads laterally, the oil will always tend to rise to the capillary fringe and spread at this level. In so doing it seems to prefer the part of the capillary fringe that has a water saturation of about 75-85 per cent.

F. Earl Ingerson

Earl Ingerson was born in Barstow, Texas, October 28, 1906, of "mixed parentage"; his father had ridden his "high wheel bicycle" from Northern Ohio to the Pecos Valley in West Texas during the late 1880's, and his mother, from central Tennessee, had arrived there, about the same time, in a covered wagon via Denton and Hillsboro, Texas.

Earl was valedictorian of his high school class in Barstow in 1924, and four years later earned the same honor at Simmons University, Abilene, Texas, where he took his BA degree in chemistry, with the highest average of any student who ever finished there.

An instructor at S.U., 1928-29, he attended Yale 1929-30, held an assistant professorship at Simmons, 1930-31, taking an MA* in June, 1931, then back to Yale as a graduate assistant 1931-32, then instructor 1932-1934, when he was awarded a Ph.D. in Geology, with honors on his comprehensive examination.

In 1934-35 he was awarded a Sterling Postdoctoral Fellowship from Yale for research in petrofabrics (structural petrology) with Professor Bruno Sander in Innsbuck, Austria.

In the spring of 1935 Earl went to the Geophysical Laboratory of the Carnegie Institution of Washington, where he served as Physical Chemist, then Petrologist until 1947, when he was called on by the U. S. Geological Survey to organize and administer their Branch of Geochemistry and Petrology. Laboratories of the Branch were located in Washington, D.C. and Denver, Colorado. They supplied chemical, spectrographic, mineralogic, X-ray, petrologic, and other laboratory data for research and field projects both of the Survey's Geologic Division and the Raw Materials Division of the Atomic Energy Commission. For this work and ideas about the directions that some of

* Sc. D., Honorary, 1942; Distinguished Alumnus, 1977.

the related research projects should take, Ingerson was awarded the Distinguished Service Medal of the Department of the Interior in 1959.

In the fall of 1958 he went to the University of Texas at Austin as Professor of Geology, and since 1977 has been Professor Emeritus. During this time he was also Associate Dean of the Graduate School (Research) for the period 1960 to 1964. This involved supervision of and responsibility for the budgets of the "Organized Research Projects" of the University, which included, among others, the Bureau of Economic Geology, Computer Center, Galveston Marine Geophysical Institute, Marine Science Institute (Port Aransas), McDonald Observatory, and the Radiocarbon Laboratory.

Early on, he had called the attention of the geologic community (and, incidentally, of most of the chemical fraternity of the time also!) to the fact that water above its critical temperature, although a gas, can dissolve as much or more non-volatile material than can liquid water at any temperature. (Econ. Geol., vol. 29, 1934, pp. 454-470). The fact that water above its critical temperature, together with data from liquid inclusions in minerals (Am. Min., vol. 32, pp. 217-225, 1947, etc.) led to a theory of the nature and origin of ore forming fluids (Econ. Geol., vol. 35, pp. 772-785, 1940, and vol. 49, pp. 727-733, 1954) which provided a mechanism for extracting metals from magmas and getting them into ordinary hydrothermal solutions without assuming large amounts of volatile compounds of the ore metals. This concept is almost universally accepted to-day, but a good decade after it was first published (1934) many economic geologists and geochemists still spoke of ore metals "escaping" from the magma as volatile compounds ("gases").

Ingerson, with a Carnegie Foundation grant and the co-operation of George

Morey, started the silicate-water studies at the Geophysical Laboratory, which have become an important part of the program there.* One of the sytems studied (H_2O-Na_2O-SiO_2) (Am. Jour. Sci., Vol. 35A, 1938, pp. 217-225, and A. J. S., Bowen Volume, 1952, pp. 343-371) defined favorable T-P-X conditions for growing quartz crystals, which were the basis of quartz syntheses by Brush Development Corporation, Bell Laboratories, and the Signal Corps., and are still used world-wide in the quartz-growing industry.

Ingerson conceived and directed the only experimental work ever done to establish the time-temperature relations necessary for the melting of highly siliceous material to form tektites.

He also wrote the first review of isotope geology (Bull. Geol. Soc. Amer., Vol. 64, 1953, pp. 301-374), which not only summarized the studies to that date, but also suggested other elements that might be used and other kinds of problems that could be attacked by isotopic methods. These researches and administration of geochemical research were recognized by award of the Day Medal of the Geological Society of America at their annual meeting in 1955.

Other researches and publications have been in petrofabrics, mineralogy, geologic thermometry (Econ. Geol., 50th Anniversary Volume, 1955, pp. 341-410), geochemistry of sedimentary carbonates, geology and geochemistry of uranium deposits, etc. He also made a detailed study, for the Board of the Economic Warfare, of all of the Brazilian quartz deposits that were being mined in 1945, and served as chairman of the Panel on Mineral Deposits (1963

* There was about a five year break in the regular research programs of the Geophysical Laboratory during World War II, while the staff members were mostly working on metallurgical problems of gun steel. The hydrothermal program was not really back on track until Earl had left the Laboratory and gone to the Geological Survey.

and 1964) of the Commission of the Ford Foundation that was advising on problems bearing on completion of the Aswan Dam, and especially, important ones that would follow its completion.

He has also been active in the Institute of Latin American Studies, having attended meetings in São Paulo, Brazilia and Mexico City. He served as a very active member of its Committee on Technical and Professional Services, helping in the organization and conduction of the largest and most prestigious symposium the Institute ever held, on Science, Government and Industry for Development, which was held in Austin, Texas, February 24-27, 1975. Ingerson edited the English language Proceeding Volume of 401 pages.

He represented the University of Texas at the International Conference on Graduate Education, organized for University Executives and held in Dubrovnik, Yugoslavia in July of 1964. That same summer he paid official visits to University of Texas projects in Cairo, Baghdad, Bankok and Taipei and visited the U. S. Geological Survey office in Karachi, East Pakistan, and the important chromite deposit they were studying near the Afghanistan border.

Prof. Ingerson has been concerned with more than just his own researches, publications, and administration of research programs. He has been interested and active in existing earth science organizations and their publications, having served as an officer, council member, committee chairman and/or committee member of G.S.A., M.S.A., A.G.U., A.A.P.G., G.S.W., Geochemical Commission of I.U.P.A.C., I.A.V.C.E.I., etc., and has served on the editorial boards of Mineralium Deposita and Global Tectonics and Metallogeny.

Of considerable more significance is the fact that he has been instrumental in the founding of national and international earth science organizations and publications. He initiated discussions of the need for a national and an international geochemical organization and called the meetings

that eventuated in the founding of the Geochemical Society (at the annual meeting of the Geological Society of America in New Orleans in 1955) and the International Association of Geochemistry and Cosmochemistry at UNESCO Headquarters, Paris, in November, 1965.

If memory serves correctly Karl Turekian nominated him for President of the Geochemical Society, a position he held for two years because the consensus was that there should not be a "change of horses in the middle of the stream", especially since the G.S.A. was not at all convinced that there should be a separate geochemical organization "in the family".

He served the first two terms as president of I.A.G.C. (1966-1972) for quite a different reason. The Russians invaded Czechoslovakia early in the week of meeting of the I.U.G.S. in Prague, 1968, so it was impossible to hold meetings of the Council or the General Assembly, and the officers automatically held over during the next fiscal period.

A group of five geologists (A. Roger Denison, Wm. B. Heroy, Sr., A. I. Levorsen, Thomas B. Nolan, and F. Earl Ingerson) sponsored the organization of the American Geological Institute in 1948. The raison d'etre was much the same as it was for the geochemical organizations, - a single voice was needed to speak for American geology, as the American Chemical Society did for chemists, the American Institute of Physics for physicists, etc. The Institute was set up and Ingerson served during its first fiscal period as Secretary-Treasurer, and during the second one as Vice-President.

He has been intimately associated with the publication and translation programs of the Institute ever since, having served as Founding Editor of International Geology Review (mostly for translations of important Russian papers) and has been designated [redacted] Founding Editor, 1984---.

Translation of the Doklady of the Acad. of Sciences, U.S.S.R., Earth Science Sections, and Izvestiya of the Academy of Sciences, U.S.S.R., Geologic Series, were also started under the editorship of Earl Ingerson. Izvestiya was discontinued after 1961, but Doklady is still published by Scripta Technica, with the co-operation of the American Geological Institute.

Prof. Ingerson also got a grant from NSF for a cover-to-cover translation of the Russian journal Geokhimiya, which was published by the Geochemical Society as Geochemistry for the years of the original publication 1956-1963. In 1964 Scripta Technica took over through A.G.I., continuing cover-to-cover translation of Geokhimiya, but publishing only the most significant papers and filling in the journal, then entitled Geochemistry International, with important geochemical papers from other Russian publications.

In 1949 Ingerson negotiated with Pergamon Press, through their representative Paul Rosbaud, for the establishment of a new and prestigious geochemical journal, Geochimica et Cosmochimica Acta. He was the Founding Editor, an Executive Editor, 1958-1961, and Editor Emeritus since 1978. He negotiated with Pergamon Press for the adoption of the Acta as the Journal of the Geochemical Society, which became effective in 1957 and allowed members to subscribe to the journal for a nominal price.

Prof. Ingerson also initiated, in 1958, Pergamon's International Series of Monographs on Earth Sciences and has been Editor-in-Chief ever since. Thirty six of these monographs have been published and the thirty seventh is in preparation.

The above material was prepared at the request of the Department of Geology and Geophysics at Yale for their records. In the meantime both the International Association of Geochemistry and Cosmochemistry and the Geochemical Society have elected Ingerson to Honorary Life Fellowship in the respective organizations and, at present, he is the only individual in this category in either one.

The I.A.G.C. has also established the Earl Ingerson Distinguished Lecture Series. The lectures will be delivered during the quadrennial meetings with I.U.G.S. Lecturers will be selected by the Council and each will have all of the expenses of attending the meeting paid, plus an honorarium of at least $1,000.00.

The Council of the Geochemistry Society has voted to establish a similar lecture series, but details have not been decided.

The I.A.G.C. has established a broad new periodical, Applied Geochemistry, published by Pergamon Press and serves as the journal for I.A.G.C. The first three issues (1986) contain only invited papers. These issues are bound in a single volume, generously called the F. Earl Ingerson Festschrift. Probably, in the long run, this will be more meaningful than the memberships and lectureships mentioned above.

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LETTER 34

March 10, 1987

Mr. Bill Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh,

34-1 I am writing to express my opposition to the proposed All American Pipeline crossing over the Edwards Aquifer.

I feel a grave mistake would be made if their pipeline were routed this way. There are too many people whose lives would be affected, in the event there ever was a "leak" or accident of some kind. San Antonio is the only major U.S. city which depends entirely on one, single source for its water - the Edwards Aquifer. For the aquifer to ever become polluted would be a MAJOR catastrophy! (i.e. A similar accident a few weeks past which polluted the water supply of the small community of Sweetwater, Texas).

I urge you to please, please insist that the All American Pipeline Company route their pipeline from McCamey to Houston via their proposed northern route, away from the aquifer. I really do not see why there is any question on whether to do this or not. It amazes me that they are even considering to run it across the aquifer!

Sincerely,

Jan Suche

Ms. Jan Suche
1215 View Ridge
San Antonio, Texas 78213

RESPONSE TO LETTER 34

34-1 Your comment regarding your support of the selection of the Northern Alternative is noted.

LETTER 35

Mr William Haigh
Public Affairs Officer
Dear Sir:

35-1 I'm against letting the all American Pipeline into or over The Edwards Plateau fresh Water Supply!

35-2 Why should foreign Oil pollute our Water + Air and put our Country into deficit because of what it does to our own Oil Industry!

35-3 And who will pay damages when Air + Water are polluted?

You say all American Oil Pipeline what does that mean?

Sincerely
Mrs R.W. Kattmann

RESPONSE TO LETTER 35

35-1 Your comment regarding the Edwards Plateau Aquifer is noted. The Edwards-Trinity Plateau Aquifer would be crossed by 191 miles of the Proposed Route, 117 miles of the Northern Alternative, or 157 miles of the Southern Alternative for the AAPL. In each case, significant impacts to groundwater quality could occur in the event of oil spills or leaks during pipeline operation; and the areas of highest sensitivity to an oil spill on the Edwards Plateau are cities and towns with groundwater supplies and important springs discharging from this aquifer.

Although the entire Plateau is considered to be a sensitive aquifer, local variations in aquifer conditions limit the potential adverse effects of an oil spill in some areas and cause other areas to be highly sensitive. Occurrence of an oil spill in an unfractured area or where fractures are filled with marl or soil would most likely be cleaned up at the surface before a significant volume of oil could infiltrate to depth. If a spill occurred and entered a zone of open fractures or solution channels, then oil could migrate relatively rapidly through these zones.

Along the Proposed Route, typical depth to groundwater is 200 to 500 feet below the Plateau surface. Of several possible sensitive receptors, the following would have the greatest chance of impact by an oil spill. The City of Ozona, because of heavy pumping, experiences groundwater movement toward the city, in spite of the fact that under normal conditions the city is upgradient of the Proposed Route. Groundwater that becomes part of spring flow or emerges from springs and then enters Kimble County as the base flow of streams could be affected. And finally, individual private and domestic wells located in the immediate downgradient vicinity of a spill could be affected.

The counties that obtain groundwater from the Edwards-Trinity Plateau Aquifer along the Northern Alternative consist of Upton, Reagan, Irion, and Tom Green. Of the several possible sensitive receptors outlined on page 3-114 of the Modifications and Corrections section, two cities are most likely to be impacted by a spill. The City of Barnhart appears to be downgradient from the Northern Alternative. In the southern portion of Tom Green County, the City of Christoval, which obtains groundwater from shallow wells and springs of the Edwards and associated limestones, is downgradient from the pipeline.

The Aquifer along the Southern Alternative is generally confined and is not a recharge area. Potential surface pipeline spills would not fully penetrate the overlying confining layers and reach the underlying Edwards. Therefore, confined sources of several springs and water supplies would not be affected by potential oil spills.

Some springs, such as Leona Springs and Soldiers Camp Springs, discharge from alluvial gravels fed by underlying artesian aquifers. In this case, an oil spill could impact alluvial gravels and the springs could be contaminated at the surface.

LETTER 35

RESPONSE TO LETTER 35

The risk to an aquifer is not only a function of significant impacts in the event of a spill, but also the function of the likelihood of a spill occurring at all. The number of oil spills over the 40-year pipeline life within any sensitive aquifer is calculated to be 5.3 for the Northern Alternative, 6.5 for the Proposed Route, and 6.7 for the Southern Alternative.

Please refer to the additional information provided on the Edwards-Trinity Plateau Aquifer in Modifications and Corrections Section 3.3 for pages 3-8 and 3-114. Please also refer to Mitigation Measures GW-1, GW-2, and GW-3 in Appendix A.

35-2 Your comment regarding foreign oil polluting the air and water resources in the U.S. is noted. Crude oil proposed for shipment through the All American Pipeline would be U.S. oil from California, or possibly from Alaska or West Texas.

35-3 Please refer to the response to Comment 18-2.

LETTER 36

Mr William Haigh
Public Affairs Officer

Dear Sir:

36-1 Why should the fresh Water Supply of thousands of people be threatened to support Foreign Oil and put us in a national deficit? when Texas is having a hard time with the economy. because of it

36-2 Why should the be get the air pollution that the wind will carry across from the refinery

36-3 Who will pay the damages when air & water are polluted? You say all American Oil Company what does that mean?

Sincerely
Ms. Lena Kathmann
Sen Del.
Mountain Home Tex 78058

RESPONSE TO LETTER 36

36-1 The crude oil that would be shipped by the All American Pipeline would be U.S. oil from California, or possibly from Alaska or West Texas.

36-2 The general supposition for the All American Pipeline was that heavy California crude would displace heavy foreign crudes (such as Venezuelan and Mexican) currently being refined in the Gulf Coast refineries. Thus, the emissions from the refineries would be covered by existing air quality permits. However, should California crude become supplemental to the heavy crude that is currently being refined and thus require refinery expansion, air quality permits would have to be reviewed and approved by the TACB before the increased refining could be done. Refineries are currently operating at approximately 80 percent of their capacity (Oil and Gas Journal 1987b).

36-3 Please refer to the response to Comment 18-2.

LETTER 37

Mr. William Haigh BLM;
Forcefully biding my mind for the all American pipe line coming through my Gillespie county.

1.
Being a safty ling in all kinds of energy crisis.
2.
Irish potatoes sure would grow early on the hot line (HA)
3.
37-1 a removable goat kidding room on the hot line in jan. would do.
How stupid a crowd can get,our Judge, talking about water pollution.
Fire can handle oil spills.
4.
They skin me alive with taxes. You All American would come sure to help me. Am sure to throw my hat on the line. Hurry up and built it.

So Till The Hot Oil Be Flowing

H.J. SATTLER
box 62
Doss, Tex. 78618
Ph.No. 512-669-2437

RESPONSE TO LETTER 37

37-1 Your comment regarding support for the All American Pipeline is noted.

LETTER 38

LAW OFFICES OF
BOWMER, COURTNEY, BURLESON, NORMAND & MOORE
A PROFESSIONAL CORPORATION
SIXTH FLOOR
FIRST NATIONAL BANK BUILDING
P.O. BOX 844
TEMPLE, TEXAS 76503
(817) 778-1354

JIM D. BOWMER
WILLIAM R. COURTNEY
BOB BURLESON
TOM NORMAND
JACK M. MOORE
BRUCE BURLESON

March 11, 1987

FEDERAL EXPRESS

Mr. William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Re: Draft EIS, All American Pipeline,
Bell and Surrounding Counties, Texas

Dear Mr. Haigh:

I enclose written comments, with several Exhibits, related to the Draft EIS of January, 1987, for the All American Pipeline.

Please acknowledge receipt of this material in the usual manner. Please place me on the mailing list for future notices, hearings, and copies. I would like to have a copy of the Final EIS.

Please make my comments a part of the record, and direct them to those in charge of final R-O-W selection if the Northern Alternative should be the ultimate route selected.

Sincerely,

Bob Burleson

BB/kh
enlcosure

LETTER 38

PROPOSED ALL AMERICAN PIPELINE PROJECT

LOCATION: NORTHERN ALTERNATIVE, BELL COUNTY, TEXAS

SUBJECT: COMMENTS AND REQUESTS BY BOB BURLESON, P.O. BOX 844, TEMPLE, TEXAS 76503

ENVIRONMENTAL IMPACT SUBJECTS: RARE BLUESTEM PRAIRIE REMNANTS AND PIPELINE CROSSINGS OF LAMPASAS RIVER, LEON RIVER AND BIG ELM CREEK

COMMENTS AND REQUESTS BY BOB BURLESON REGARDING THE ROUTE OF NORTHERN ALTERNATIVE IN AND NEAR BELL COUNTY, TEXAS

TO THE BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR; ERT, A RESOURCE ENGINEERING COMPANY; and ALL AMERICAN PIPELINE COMPANY, GENTLEMEN:

My name is BOB BURLESON. I am a lawyer by profession and by avocation a farmer and naturalist. I served on the Texas Parks & Wildlife Commission for some seven years, and have devoted a large part of my time for the past twenty years to botanical research related to tallgrass or bluestem prairies in the Blackland Prairie of Texas. My wife and I have devoted substantial financial resources to the goal of preserving the very few remnants or relicts of this originally grand resource. We have purchased one of the best of the remnants, MARUNA MEADOW, now a State Historic Site in Bell County, Texas and a Bell County Natural Area, and have replicated on a farm of about 425 acres that we live on a large prairie site for the preservation of genetic components of many small prairie remnants that have since been destroyed by

LETTER 38

roads, urban sprawl, pipelines and other developments. Additionally, we have personally surveyed every mile of county roads in Bell County and most of the county roads of Falls and McLennan Counties, and have mapped and recorded every native prairie remnant still extant. With this background, it is my belief that the input I can give is valid and should be useful.

ASSUMPTION: I am commenting on the DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT and specifically, the NORTHERN ALTERNATIVE. It is my assumption that the NORTHERN ALTERNATIVE will be the route eventually selected, since the BLM has already indicated its preference for that route. The Draft I am working from is the two-volume Draft of January, 1987.

PURPOSE: The purpose of these comments is not to oppose the pipeline, because I presume that it will be built, but to assure that those who make the final determination of route will miss the most ecologically sensitivie areas in Bell and surrounding counties and thereby avoid damage that is irreparable. I also have some comments on the creek and river crossings, since I have suffered two (2) separate oil spills in the past fifteen years on my own farm, which is crossed by an older and smaller crude oil pipeline.

38-1

To avoid duplication of effort, I will refer to and attach some materials that were prepared for a similar hearing on another pipeline project, the ETSI COAL SLURRY PIPELINE, which had a

RESPONSE TO LETTER 38

38-1 Your comment regarding rare bluestem prairie remnants is noted. After measuring the distances between the prairies (i.e., Burleson and Maruna Prairies) and the Northern Alternative route and determining the distances to be approximately 2 and 4 miles, respectively, we agree that the Northern Alternative would not impact these meadow sites.

parallel route proposed through Bell County, Texas. Therefore, if some of my Exhibits refer to the ETSI project, please do not be confused. Volunteer efforts are too expensive to waste money!

THE BLACKLAND PRAIRIE OF TEXAS AS AN ENDANGERED NATURAL RESOURCE: Tallgrass prairie in general is an endangered resource on a national basis. The Blackland Prairie of Texas is so endangered that it is almost extinct. The great majority of remnants of this great natural resource that once covered millions of acres in Texas are now scattered, small tracts, mostly less than twenty acres in extent, and surviving under the constant threat of fencing, grazing and agricultural modification. When my wife and I saw, some years ago during a period of high grain prices, how many of these remnant "hay meadows" were being plowed up to plant corn and milo, we devoted two full growing seasons to collecting (by hand and with a homemade seed stripper) as much seed of every grass and forb as we could, from as many meadows as we could cover. These were planted in a replicated meadow on our farm, and this action turned out to be the only preservation of the gene pools of many of these meadows, now completely gone. The very few that are left we monitor regularly, and do our best to educate the owners about use and management and the scientific value of their preservation.

38-1 Cont.

I attach hereto EXHIBIT "A", a map of Bell County, along with EXHIBIT "B", a map of Falls County, and EXHIBIT "C", a map of

LETTER 38

RESPONSE TO LETTER 38

McLennan County. All the known prairie remnants in each county are marked on the map. The marks are larger than the remnants! I also attach as EXHIBITS "D" and "E" copies of scientific articles by three of the most qualified scientists now doing work on the Blackland Prairies of Texas, as proof of the endangered status of this resource. It is impossible for any competent and honest person to look at the remaining portions of the Blackland Prairies of Texas and arrive at any conclusion except one: The last remnants of this natural resource are probably the single most highly endangered ecosystem found in this part of Texas.

38-1 Cont.

I therefore ask that every possible effort be made to be sure that no part of the NORTHERN ALTERNATIVE impacts on any of these known remnants, or upon any other remnants that I have missed in my surveys. At this stage, the pipeline is merely a line on a map, and shifting it a few hundred feet one way or the other in final real estate acquisition could save a vanishing resource.

COMMENT ON THE ENVIRONMENTAL IMPACT STATEMENT IN GENERAL: I've read several hundred EIS's over the years and this Draft EIS is better than the average by far. Careful attention has been paid to the most likely events that mayoccur over the life span of the project. Although human experience teaches that estimates of the frequency of future breaks and the harm to come from them is subject to a substantial factor of uncertainty, the estimates

LETTER 38

given are at least reasonable and have some basis in factual experience.

One factor that does need to be kept in mind, however, is that the statistics and probabilities are all based on the assumed 40-year useful life of the pipeline. Personal experience with a crude oil pipeline that is now in its 60th year of use tells me that:

38-2 (a) The ALL AMERICAN PIPELINE will be in place and used for a much longer period of time than 40 years, without replacement of the original pipe.

38-3 (b) As the pipe ages, corrosion will take its toll, despite the best of cathodic protection.

38-4 (c) In the later years of its life, there will be more seeps, leaks and breaks than is presently forecast.

38-5 (d) Detection capabilities of seeps and slow leaks are not good with respect to small but steady escapes that do not puddle on the surface. This is particularly true in the winter, when vegetation is already dead from frost. The leaks in the existing pipeline have been discovered only when damage was already taking place to both the surface and underground water.

38-6 (e) Economics generally dictates the attitude of pipeline operators toward leaks and seeps, and aged lines are not replaced until the labor and material costs of repairs

RESPONSE TO LETTER 38

38-2 Your comment regarding the assumed 40-year project life is noted. The 40-year project life is based on the normal economic longevity of the pipe. After 40 years, the maintenance and operating costs of the older pipe makes it less economically attractive.

38-3 The cathodic protection system proposed by AAPL follows current industry practice for such systems and is among the best currently available. AAPL is required to check the performance of the cathodic protection system annually in accordance with 49 CFR Part 195. Corrosion flaws detected by these tests must be repaired. Please also refer to the response to Comment 29-5.

38-4 The comment correctly states that the probability of oil leaks will increase with pipeline age. However, the analyses conducted as part of the Draft SEIS accounted for the degradation of the pipe with age by estimating the average spill frequency over the 40-year project life.

38-5 Please refer to the revised Table 4-2 in in Modifications and Corrections section for an updated description of the leak detection system. New information concerning chronic low-volume leaks is included in the Modifications and Corrections section for page 4-4.

38-6 AAPL's intention is to respond to any oil leak in the pipeline upon detection, repair the leak, and cleanup any damage. Please refer to the Oil Spill Contingency Plan contained in Appendix B of the Draft SEIS.

LETTER 38

38-6 Cont. starts to equal the cost of replacement of the whole line.

38-7 (f) A crude oil leak in a native prairie will essentially sterilize the soil touched by the crude oil. I have one spill of less than an acre that is some six or more years of age, and to date only a very few annual weeds will grow on the site.

38-8 (g) It is misleading in a way to speak of "aquifers" and to refer only to known and identified water-bearing strata. Most farm livestock water, and a substantial amount of farm domestic water, in Bell County, is obtained from shallow, dug or bored wells that collect ground water from only the top 20 to 40 feet of the soil profile. These shallow wells are easily subjected to pollution by an oil seep or leak from a nearby crude oil pipeline.

38-9 SPECIFIC BELL COUNTY PRAIRIE SITES THAT SHOULD BE AVOIDED AT ALL COSTS: Attached hereto as EXHIBITS "F" and "G" are maps showing the MARUNA MEADOW, a State Historic Site so designated by the Texas Historical Commission in Austin, and the two replicated prairies on our farm, containing the gene pools of many prairie remnants now destroyed and gone. These three sites should be avoided as to all impacts of the project. EXHIBIT "H" is a copy of Map 2-3, Sheet 6, from the EIS, Section M-16, with these three meadows marked in red ink on it. As currently proposed, the NORTHERN ALTERNATIVE should miss all three meadow sites, but

RESPONSE TO LETTER 38

38-7 Your comment regarding your specific experience with an oil leak on native prairie is noted. An oil spill would not impact the Burleson and Maruna Prairies due to their distances from the route. Please refer to the response to Comment 38-1 and revised Mitigation Measure TB-1 in Appendix A concerning mitigation of impacts in sensitive areas.

38-8 Your comment regarding shallow wells is noted. Please refer to Mitigation Measures GW-1 and GW-3 in Appendix A.

38-9 Please refer to the response to Comment 38-7.

LETTER 38

38-9 Cont. because changes in route are always possible, these unique sites are here called to your attention.

38-10 COMMENTS ON THE CROSSINGS OF LAMPASAS RIVER, LEON RIVER, LAKE BELTON AND BIG ELM CREEK: An oil spill into running water is a disaster of first magnitude. At the current time, water quality is good in all three of these streams, and every effort should be made to avoid future spills into these streams.

38-11 MITIGATION MEASURES FOR STREAM CROSSINGS: It is suggested that more Block Valves be installed on each side of these major stream crossings, to lessen the amount of any spill into the stream. Block Valves should be required on both sides of the stream crossings of LAMPASAS RIVER, LEON RIVER, LAKE BELTON and BIG ELM CREEK. Doing this will protect not only these streams but the Little River and Brazos River to which they are tributaries. By "Block Valves" I am also referring to "Check Valves" or any other valve that will contribute toward lessening the amount of oil discharged due to a break at any of these stream crossings. Automatic or Remote Block Valves are preferred over manual, due to the increased rapidity of response with respect thereto.

38-12 Additionally, at the crossings of LAMPASAS RIVER, LEON RIVER, LAKE BELTON and BIG ELM CREEK, the following preventive measures should also be required:

(a) Pipe wall thickness should be increased to 0.500 inch at each of these crossings.

(b) The pipeline should be coated in concrete and buried

RESPONSE TO LETTER 38

38-10 Please refer to the responses to Comments 38-11 and 38-12 for potential oil spill impacts to these surface water bodies.

38-11 The Northern Alternative crosses the headwaters of the Lampasas River. At the crossing, the Lampasas River is an intermittent stream with a stable crossing; please refer to Table 3-42a in the Modifications and Corrections section. The crossing is 75 miles upstream of Stillhouse Hollow Reservoir. Any potential oil spill should be contained before it reaches this reservoir.

The Leon River is crossed 50 miles upstream of Belton Reservoir. Any oil spill should be contained before it reaches this reservoir. Additionally, a remote-control valve is proposed at the Leon River to reduce the volume of any potential oil spill; please refer to Mitigation Measure SS-2 in Appendix A.

For a discussion of Big Elm Creek, please refer to the response to Comment 38-13.

38-12 The measures suggested in the comment are included in the project description for major river crossings such as the Lampasas River, Leon River, and Big Elm Creek; please refer to page 2-27 of the Draft SEIS.

in the manner shown on Figure 2-6 of the EIS.

38-13 It is my understanding from the EIS that BIG ELM CREEK is not scheduled for treatment as a "river", and because of its importance to the ecology of east Bell County, I suggest that the increased pipe wall thickness and concrete coating called for at major stream crossings should be applied to it.

ADDITIONAL EXHIBITS: In addition to the foregoing, other articles, letters and exhibits that may assist you are attached and given proper numbers.

REQUEST THAT THIS COMMENT BE MADE A PART OF THE PERMANENT RECORD OF THIS HEARING: It is requested that this comment and its attached exhibits be made a part of the permanent record of this hearing and that copies be provided to those who are in charge of the final route selection of the pipeline through Bell and surrounding counties.

FOR QUESTIONS OR OTHER INFORMATION
REGARDING SENSITIVE SITES IN BELL
AND SURROUNDING COUNTIES, CONTACT:

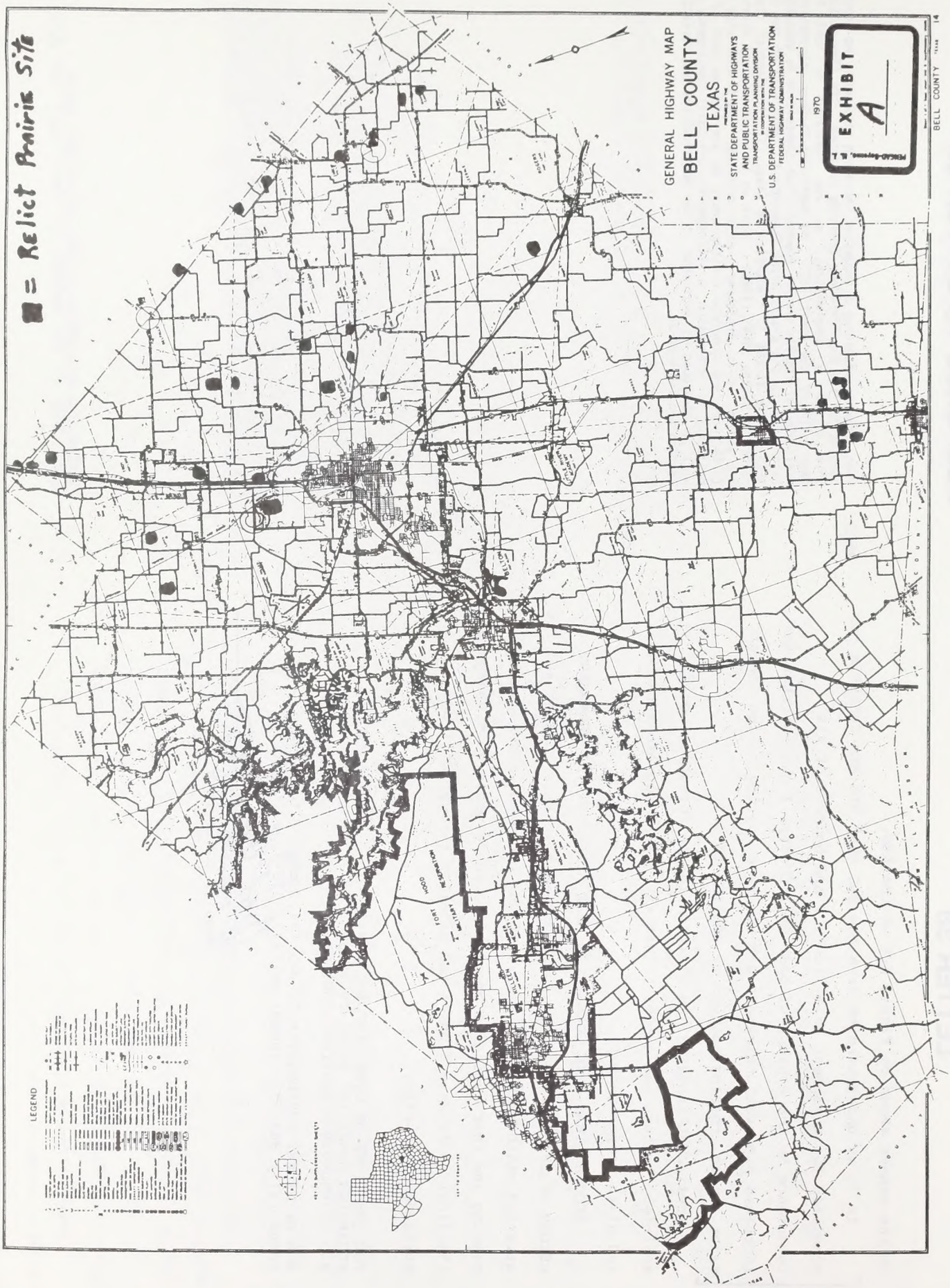
BOB or MICKEY BURLESON, P.O. Box 844, Temple, Texas 76503.
Phone (817) 984-2265 (home) or (817) 778-1354 (office).

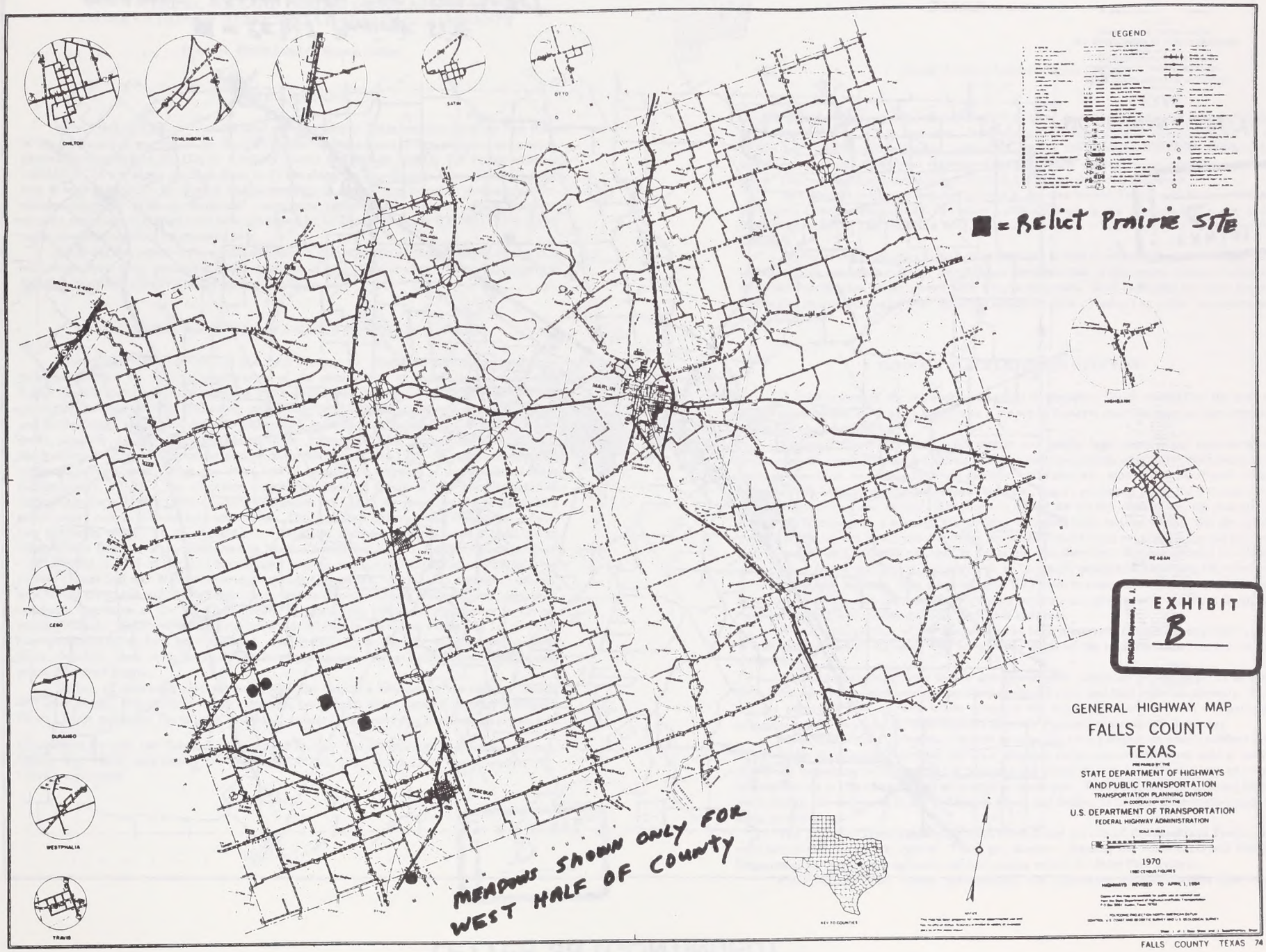
Bob Burleson

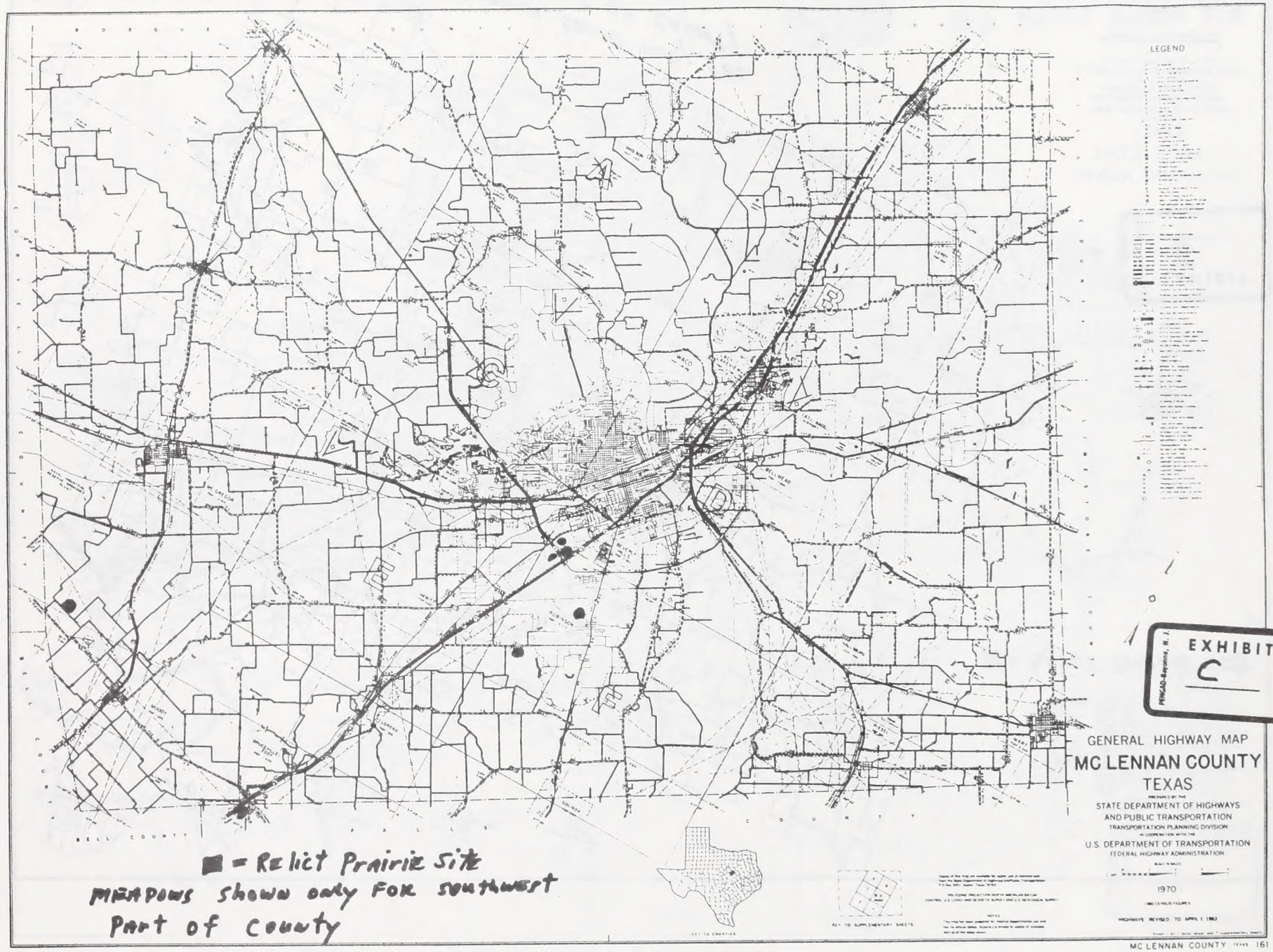
BOB BURLESON, P.O. Box 844,
Temple, Texas 76503

38-13 Your comment concerning a suggested increased pipe wall and concrete coating for the Big Elm Creek crossing is noted. The flow status of this stream is intermittent, as was indicated in Table 3-40, page 3-119 of the Draft SEIS. No published fishery information is available for Big Elm Creek. However, fish composition is expected to be similar to the Brazos River (Appendix E, Table E1-5 of the Draft SEIS). The stream is classified as Class III (substantial fishery resource) by the USFWS (1978). Since an important fishery exists in the stream, it is considered a major crossing. The thicker pipe wall (0.50 inch) and concrete coating would be provided as part of the project. For mitigation, a site-specific Oil Spill Contingency Plan will be developed as indicated in the Modifications and Corrections section for Table B4-1a.

LETTER 38 (CONTINUED)




LEGEND
■ = Relict Prairie Site
CHILTON
TOMLINSON HILL
PERRY
SATIN
OTTO
CEBO
DURAMBO
WESTPHALIA
TRAVIS
MARLIN
LOTT
ROSEBUD
MEADOWS SHOWN ONLY FOR WEST HALF OF COUNTY
KEY TO COUNTIES
EXHIBIT
B
GENERAL HIGHWAY MAP
FALLS COUNTY
TEXAS
PREPARED BY THE
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
1970
HIGHWAYS REVISED TO APRIL 1, 1984


LEGEND
GENERAL HIGHWAY MAP
MC LENNAN COUNTY
TEXAS
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TRANSPORTATION PLANNING DIVISION
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
1970
EXHIBIT
C
■ = Relict Prairie Site
MEADOWS shown only FOR southwest
Part of County

THE BLACKLAND PRAIRIE OF TEXAS: CONSERVATION OF REPRESENTATIVE CLIMAX REMNANTS

David H. Riskind and O. Brown Collins

INTRODUCTION

The Blackland Prairie, a major land resource area of Texas, extends from the Red River in the northeastern portion of the State to the San Antonio River in the southwest and encompasses approximately 4,260,000 ha (Godfrey, Carter and McKee, 1969). The Prairie varies in width from 70 km along the Red River to 12 km along the San Antonio River. Climatic gradients as well as variation in edaphic factors combine to form a vegetationally diverse plant formation composed of seven distinctive community types. Community dynamics, floristics, climatic and edaphic factors have been discussed by Collins, Smeins and Riskind (1975) at this conference and need not be repeated here.

In order to preserve the biotic diversity so characteristic of the Blackland Prairie it is incumbent upon us to preserve selected remnants of each of the seven community types which together constitute the Blackland Prairie of Texas.

HISTORICAL BACKGROUND AND CONTEMPORARY TRENDS

During the middle portion of the 19th century the Blackland Prairie was considered prime rangeland. By 1880, however, most of the productivity of the Blacklands was insufficient for the purposes of self-sustained cattle production (Nimmo, 1885). Conversion from grazing to farming economy profoundly influenced the Blacklands. Improved tillage equipment and methodology soon made possible widespread and intensive cultivation of agricultural products, primarily cotton (Bolton, 1914). Efficient, mechanized farm implements and large scale agri-business merely accelerated the decline of the Blacklands. By 1910, the region supported a higher population density than any other area of comparable size west of the Mississippi River (Goldenweiser, 1919). The Blackland Prairie continued to sustain a large rural population through the early 1900's (Bonnen and Thidobeaux, 1937), but the great drought of the 1930's forced many people to move into urban areas. This migration spawned a trend in urban growth that continues today. In all, slightly over 10% of the Blackland resource area is classified as urban (Texas Soil and Water Conservation Needs Committee, 1970a). Current figures indicate 1,725,000 ha or 68% of the land is cultivated with an additional 850,000 ha or 22% in tame pasture (Texas Soil and Water Conservation Needs Committee, 1970b). As a result of cultivation, overgrazing, and other often imprudent landuse practices, there are few, if any, remnants of climax vegetation of the Blackland Prairie. A speculative but liberal estimate as to the remaining remnant Blackland tracts would be 1% or 43,000 ha. Included within this 1% are remnant grasslands which have been managed, some intensively so, for hay meadows and pasturelands; therefore, there remains a pitifully small percentage of what ecologists would consider prime Blackland Prairie.

Today, all remaining plots are small with the largest, a commercial hay meadow, about 810 ha in extent. *The majority of the remaining prairielands are in Lamar County of northeast Texas.* These northeast Texas grasslands have remained unplowed due to their high productiv-

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EXHIBIT D

ity (the result of climate, rich soils and lengthy growing seasons) which has led to their "conservation" in the form of hay meadows. Most of the hay meadows were commercialized by the 1850's and several have remained productive to this day; however, not without ecological sacrifices. Production has been maintained through heavy application of fertilizers and herbicides. The ecological consequences are obvious and need not be detailed herein.

Yet another center of remnant prairies is the area around Temple and Waco in Bell and McLennan Counties respectively. Virtually nothing remains in the southwestern region of the Blacklands between the Colorado and San Antonio Rivers in the vicinity of Austin and San Antonio.

Today as municipalities grow and expand and as land increases in value, more and more remnant plots are being replaced by suburban developments, trailer parks, industrial districts, retirement ranchettes, urban sprawl, feed lots, or cropland. Such biological travesties are proceeding at an unprecedented rate, tragically enough in spite of today's so-called "environmental enlightenment."

REMNANT BLACKLANDS: AN OVERVIEW

A brief review of the remaining categories of Blackland Prairie reveals that the need for prairie conservation in Texas is imperative if we are to conserve even the most meager representative Blacklands remnants.

Remnant Blacklands include life estates and similar legal trusts which have somehow maintained the land in its natural character. Also there are parcels which have been maintained through long term ownership by single families. Unfortunately, most of the Blacklands in such categories are held by elderly individuals with few, if any, provisions made for the custody of the resource upon their deaths. Although no figures are readily available on the quantity of Blacklands held in such a manner, it is strongly suspected to be relatively high. But the elderly owners of Blacklands constitute one of the most significant factors responsible for the preservation of parcels of grasslands not only in Texas but also elsewhere. Perhaps because the elderly are tied to a traditional life on the prairie or to the yearly practice of harvesting the variety of forbs, grasses and legumes from a hay meadow they seem to venerate the unbroken prairie sod. Once the land resource is inherited by younger generations, however, the prairie is invariably "plowed under" for a seemingly more profitable endeavor.

A miniscule portion of the Blacklands has been preserved through direct private action or indirectly by conservationists who have shown an owner the value and merits of prairie conservation.

Unfortunately, lands held in the abovementioned categories are destined to be short term holdings, at least under our present laws governing taxes and land value assessments. Without tax incentives and tax laws which recognize the value of the conservation of significant natural resources there can be little hope for privately financed conservation endeavors.

Municipalities and industrial interests have within their jurisdiction some excellent remnants of the Blacklands, but these plots are destined to be consumed. Such land is owned purely for expansion or for speculative purposes and unless there is a remarkable turn of events all prairielands in this category will invariably be destroyed. Today we know of remnant Blacklands within the corporate limits of Temple, Waco, and Dallas, Texas, but their destiny appears to be all too clear.

The State of Texas apparently owns no remnant parcels of the Blackland Prairie, not even within the State Park System. There are, however, plans by the Texas Parks and Wildlife Department for prairie management and restoration within the State Park System.

Parenthetically, we should acknowledge the restorative measures which have been

initiated by a few dedicated Texas conservationists. Although these individuals are few in number, their contribution is particularly significant because they have demonstrated that prairie restoration in the Blacklands is indeed feasible, given dedication, perseverance, and time. We must not, however, be deluded into accepting prairie restoration as the ultimate solution to the conservation of our irreplaceable prairie resources, for restoration is merely a single, although important, aspect of prairie conservation. Meaningful prairie conservation must concentrate upon the acquisition of ecologically and biologically sound tracts of remnant grasslands.

None of the State owned universities own any preserves or natural areas in which there remain significant portions of Prairie. However, the Texas Research Foundation at Renner, Texas was recently deeded to the Texas A&M University system as a research station and contains a small Blacklands plot.

Because of the special nature of a land grant university system an assessment should be made of lands over which the State universities may exercise some control. The result of such an assessment could conceivably reveal that the State does indeed have a great deal of influence over some valuable Blackland Prairie remnants.

Private academic institutions neither control nor own any parcels of Blacklands; however, such institutions *may* be able to exercise significant influence over the disposition of prairielands. It is possible that within the public school lands of Texas there are extant remnant Blacklands; at this time, however, we are unable to verify this contention.

The most significant remaining tracts of Blackland Prairie are the private, commercial plots managed for native hay production. In fact, the largest single remaining tract is an 810 ha hay meadow in Lamar County in northeast Texas. Although Blacklands managed as hay meadows still maintain the character of a prairie whose sod has not been broken, they are far from prime examples of pristine Blackland community types. Mowing and the arbitrary use of herbicides and fertilizers to increase production have greatly diluted the native biota which was once a part of these prairies. Yet these very hay meadows may form the backbone of an extensive Blacklands preserve, for through management they can be restored and in time they will recover completely.

Aside from the very minor contribution made to the remnant inventory of Blacklands by "defacto plots" and others which are usually inaccessible for exploitation, such as corner plots, rights-of-way, and rough inaccessible terrain, the two remaining categories of remnant prairie are lands owned either by the Federal Government or by private non-profit foundations.

The United States Department of Agriculture controls 202±ha within its Blacklands Research Station at Riesel and Temple. Some of the remaining plots have been studied extensively, particularly with regard to the effects of fire and mowing (see Smeins, 1972). One of the Station's plots was among the first stand of Blackland Prairie to be quantitatively analyzed. Dr. E. J. Dyksterhuis studied the Blacklands here in 1946 (unpublished manuscript). Unfortunately, as in all large agencies, there is frequently a lack of purpose, sensitivity, or well defined goals; at the Blackland Prairie Research Station this had led to the arbitrary destruction of significant parcels of prairielands to be replaced by the ubiquitous sorghum and cottom fields. Too, watershed research has led to the disturbance of other fine remnant plots. Had the Federal Government understood the plight of prairielands in Texas it is doubtful that the pristine prairie would have been destroyed for such short term gains.

Other Federal Agencies, such as the Corps of Engineers, United States Department of Agriculture, or the Department of Defense may own additional small prairie remnants but unless a comprehensive survey is initiated we will most likely never be able to determine the exact status of the remaining portions of the Blackland Prairie in Texas.

As in all situations there is always a ray of hope. The Texas Chapter of the Nature Conservancy now owns a 40 ha prairie in Lamar County, now known as Tridens Prairie. Formerly a hay meadow, this parcel is now recovering nicely and represents one of the singularly most

unique community types of the Blackland Prairie, the *Sporobolus-Tridens-Paspalum* type (see Collins, Smeins and Riskind, this volume, for a detailed description of this community type). Tridens Prairie represents the only tract of Blacklands which is now held in perpetuity by any method--it is therefore a milestone for Blackland Prairie conservation in Texas. All remaining plots are vulnerable and subject to destruction and it is altogether too clear that an entire ecosystem with its concomitant communities is threatened in Texas.

CONSERVATION STRATEGIES

Thus far we have presented a rather pessimistic summary of the plight of the remnant parcels of Blackland Prairie in Texas. That grasslands over the world are threatened is no new revelation, but until now few conservationists have attempted to focus attention upon the Blackland Prairie of Texas. As we shall see, conservation of grassland resources has much in common the world over.

Delineation of conservation problems is often easy, but the issue of paramount importance is one of delineating a vehicle for action.

As has been mentioned earlier in this conference, we know of approximately 360 remnant tracts of Blacklands as of 1970. Eighty-three of these have been quantitatively sampled. All were prime candidates for natural preserves. Today, however, about half of these prime 83 tracts have been destroyed. Some are now cultivated fields of milo or cotton; others are suburban developments. Although the 1970 survey was effective, it was not comprehensive. There was no subjective appraisal of the resources, nor were any provisions made for monitoring the resources.

In order to create a viable, dynamic program for Blacklands preservation we must first establish a Blacklands inventory and survey. At present a similar project called "The American Prairie Inventory" is being conducted by the Nature Conservancy. This project is indeed ambitious, but we are more chauvinistic and, without detracting from such a comprehensive survey, we would like to focus attention on the Blackland Prairie of Texas--a truly remarkable and seldom appreciated grassland resource of North America.

Our proposed survey would appraise the resources as well as locate them and provide the all-important ownership and historical data. The community types described by Collins, Smeins and Riskind (this volume) would serve as the basic descriptive tool for the Blacklands survey.

Obviously, an organization is needed which can serve to direct, fund, and coordinate the requisite guidance. Such an organization is now in the incipient stages of formation in Texas and is to be called the Texas Prairie Foundation. This organization will act as a clearing house for all information pertinent to the Blackland Prairie in Texas (other types of grasslands in Texas will as well be included). The Texas Prairie Foundation will also fund, buy, sell, trade, accept as gifts and/or administer life estates for the purposes of conserving prairielands within Texas. In addition, it will direct research, provide for educational materials and information relevant to prairie resources, management, and restoration and will offer consultation services for those in need of advice on the conservation or management of prairielands. A governing board will administer and manage all such grasslands as become the property of the Foundation. In essence, the Texas Prairie Foundation will act as a forum and clearing house for all matters pertinent to grasslands in Texas, with special emphasis on the Blackland Prairie.

Although the formation of a Prairie Foundation in Texas would do much to further the conservation of grasslands within the State, we must recognize that the Foundation is only a means to an end and certainly not an end in itself. It is only through well organized, highly

vocal interest groups, both public and private, that conservation efforts become fulfilled; to be successful we must utilize and affect the numbers of *existing* conservation entities whether they be local or national, public or private.

Basic to all conservation endeavors is a comprehensive program of sound landuse planning which, unfortunately, has yet to be adopted either statewide or nationally. The various Councils of Government throughout Texas may eventually succeed in promoting a semblance of sound landuse planning but all too often the "COG's" are mouthpieces for growth-and-development motivated organizations. Nevertheless, several Councils have been paying particular attention to the conservation needs of their areas. It remains our public duty, however frustrating, to try to influence the institutions which can potentially be of assistance in attaining grasslands conservation as well as sound programs of landuse planning.

The institutions of higher learning must be drafted into action for, as has been eloquently stated by Hugh Iltis (1969, 1972a, 1972b, 1974), if the universities as repositories of knowledge and influence are not interested in conserving our natural heritage, then we are indeed lost.

Texas is unique among most states in that its universities do not maintain a system of natural area research stations. Certainly the larger more prosperous range and agricultural oriented universities such as Texas A&M and Texas Tech would do well to begin a program for acquisition of ecologically significant lands upon which to conduct research and monitoring of native grasslands. Oregon, Washington, Illinois, Wisconsin, Indiana and California have excellent systems of this kind which we would do well to emulate. Since most of Texas was historically grassland any system of natural research areas should reflect this biological fact. Other State institutions must acquire significant natural areas with particular emphasis on grasslands, for the grasslands are disappearing at an unprecedented rate. The Texas Parks and Wildlife Department has enactments which provide for the acquisition of natural areas, but funds must be appropriated by the State legislature for each proposed acquisition. Necessarily, therefore, the public must again lobby for specific conservation measures.

The State Highway Department would do well to emulate Iowa's program for maintaining native grasslands within the highway rights-of-way. The area within rights-of-way in the Blackland Prairie makes the conservation potential impressive. But initiative on the part of the Texas Highway Department must be cultivated. Such is the public's never-ending task.

Conservation of a large, significant natural area is often enormously difficult; e.g. Tall Grass Prairie National Park, but what of the difficulties encountered in attempting to protect a patchwork of small plots scattered over a vast area. The drawbacks appear to be insurmountable, but there is nothing unique about such an approach. Many of our National Parks and State Parks contain several distinct subdivisions as do our National Forests. The Big Thicket Biological Preserve contains a number of ecological units spread over several hundred thousand acres in southeast Texas. The precedent has been established and fortunately so, for in order to preserve the diverse community types which constitute the Blackland Prairie we must acquire small unconnected plots. Some parcels would be remote, but nevertheless any preservation of the Blacklands should include each major community type. At present there is only a small hope that we will be able to preserve the biota of these prairie communities but we certainly must attempt to preserve a representative portion of the plant communities. Hopefully, the remainder of the biota will follow. Unless action is taken in the very near future it is doubtful whether there will remain examples of each of the Blacklands community types. International concern for the loss of individual species is, at present, profound; how shall we demonstrate our concern for the inevitable loss of a biotic community?

CONCLUSIONS

The Blackland Prairie of Texas represents one of the nation's outstanding grassland resources, yet it has been exploited nearly to the point of oblivion. Small, widely scattered plots are all that remain. Of the seven major community types within the Blackland Prairie, only one is thus far preserved in perpetuity--the 40 ha Tridens Prairie in Lamar County, northeast Texas. If the remaining six community types of the Blacklands are to be preserved, as well they should be, conservation measures will have to be taken decisively and deliberately and in the very near future, for the prairie resources are being consumed by the relentless purveyors of "progress."

It has been intimated that the soon to be formed Texas Prairie Foundation will shortly assume an active role in prairie conservation in Texas; yet, it is only through active and vocal public participation that conservation can be successful. It is the public who must solicit and demand conservation programs of our State and Federal agencies. The public must lobby for landuse planning and tax relief for conservation lands in public and private ownership. Moreover, authorities and academicians must continue to give unselfishly of their expertise on ecological matters or management practices so that the lay public can translate this sound advice into demands and/or action. Such cooperation has worked in the past, but we must not relent if it is to work in the future.

Finally, we feel it necessary to emphasize land acquisition of ecologically sound remnant Blacklands as the most significant conservation measure. Although merely acquiring land, either through State or Federal agencies or through private foundations, is but a simplistic conservation beginning, it is nevertheless a step in the right direction. Management policies and guidelines can be integrated into a comprehensive conservation program in due time; but if we fail to acquire representative remnant tracts of Blacklands today, there is every likelihood that they will not be available tomorrow--we are all too painfully aware of the consequences of delay in the conservation movement.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge Dick Phelan and Judy Riskind for their editorial assistance and Debbie Balser for her valuable stenographic abilities. We also wish to thank our sponsoring agencies for supporting our participation in the IV Midwest Prairie Conference.

ABSTRACT

The threat to the biological integrity of the Blackland Prairie of Texas is discussed. Historical events as well as recent and current landuse practices which pertain to the continued existence of the few remaining climax remnants of the Blacklands are outlined. The status of the Blacklands communities as viable biological resources as well as the mechanisms for prairie conservation in Texas are elucidated.

KEY WORDS

Blackland Prairie, conservation, natural areas, grasslands, prairie, Texas, Blacklands.

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PLANT COMMUNITIES OF THE BLACKLAND PRAIRIE OF TEXAS

O. Brown Collins, Fred E. Smeins, and David H. Riskind

INTRODUCTION

The Blackland Prairie (Godfrey et al. undated), one of 16 land resource areas of Texas, has been included in numerous treatments of North American midcontinental grasslands. Tharp (1926) referred to the Prairie as the *Andropogon-Stipa-Aristida* association, based on dominants of successional stages. Küchler (1964) recognized the Blacklands as an *Andropogon-Stipa* association and Carpenter (1940) considered *Sorghastrum avenaceum* the binding dominant. Livingston and Shreve (1921) described the Blackland Prairie as a grassland-deciduous forest transition while others include it as a component of the Coastal Prairie (Weaver and Clements, 1938; Clements and Shelford, 1939). Dodd (1968), in a general treatment of North American grassland associations, included the Blackland Prairie as an extension of the True Prairie, as did Allred and Mitchell (1954). The San Antonio Prairie, a large island of the Blackland Prairie within the Oak-Hickory forest association (Braun, 1950), has been identified as a part of the True Prairie (Launchbaugh, 1955) and similar to the Fort Worth Prairie as described by Dyksterhuis (1946). No quantitative studies of the climax vegetation of the Blackland Prairie have heretofore been published.

The purpose of this study is to provide a systematic, quantitative description of native grassland remnants of the Blackland Prairie of Texas. Specific objectives are: (1) to quantitatively describe the dominant species composition of these remnant prairies, (2) to relate this species composition to edaphic and climatic variables, and (3) to provide information to more objectively relate the Blackland Prairie to other North American grasslands.

STUDY AREA

The Blackland Prairie forms a narrow band bordered on the north by the Red River, the east by the East Texas Timberlands, the west by the Eastern Cross Timbers (Hill, 1901; Carter, 1931; Johnston, 1931) and extends southward into the Rio Grande Plain (Godfrey et al. undated) (Fig. 1). The Colorado River forms the southern boundary for this study. The Prairie is approximately 70 km across in the north and narrows southward to about 12 km. It covers an area of over 4,260,000 ha. Inventories often include with the main Prairie several outlier prairies, the largest of which are the Fayette and San Antonio Prairies (Johnston, 1931). Only the main belt is included in this discussion and will be referred to as the Blackland Prairie or Blacklands.

Approved by the Director, Texas Agr. Exp. Sta. as TA–11462.

Portions of this study were conducted as partial fulfillment for a Master of Science degree by the senior author.

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EXHIBIT E

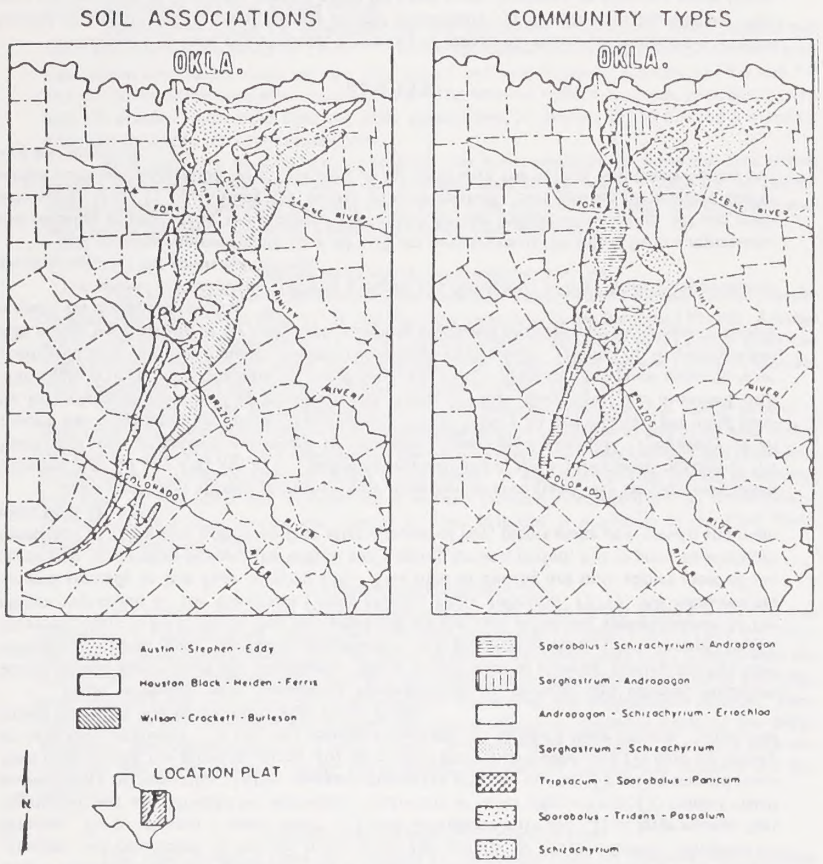

Fig. 1. Soil associations and plant community types of the Blackland Prairie of Texas.

Average annual precipitation varies from 115 cm in the north to 75 cm in the south. Virtually all precipitation occurs as rain with May and September peaks (Carr, 1967). Growing season increases from north to south and varies from 260 to 290 days (Blood and Hildreth, 1958). Average annual temperatures vary from 18 C in the northernmost portion to 21 C along the Colorado River (Carr, 1967).

The Blackland Prairie has a coastward or southeastward orientation. Relief is gently undulating and is marked by numerous mammillary hills with gently rounded slopes. Four major streams dissect the Blacklands. From north to south they are the Red, Trinity, Brazos and Colorado.

Geologically the Blackland Prairie may be longitudinally subdivided into five parallel north-south units. These divisions, from west to east are the Eagle Ford, Austin, Taylor, Navarro and Midway Groups (Hill, 1901). The Eagle Ford Group consists of well-laminated shales, the Austin and Taylor Groups are limestone, the Navarro is primarily calcareous shaly clays, sandy clays and sands and the Midway is characterized by calcareous sandstone, soft gypsiferous clays and limestone (Sellards et al. 1932).

Parent material variety results in associated soil diversity. Three major associations are recognized across the Prairie from west to east; the Austin-Stephen-Eddy, Houston Black-Heiden-Ferris and Wilson-Crockett-Burleson (Godfrey, 1964) (Fig. 1).

Austin-Stephen-Eddy Association

Derived from the Austin and Eagle Ford Groups, soils of this association are brown silty clay and clay loam Mollisols which are thermic, carbonatic and shallow. The "A" horizon has a maximum depth of 38 cm and the "C" horizon occurs within 75 cm of the surface. Differentiating characters are chalk fragments and $CaCO_3$ concentrations in lower portions of the solum.

Houston Black-Heiden-Ferris Association

This association, derived from the Taylor and Navarro Groups, covers the largest percentage of the Blackland Prairie and has long been considered typical of the region (Carter, 1931; Godfrey, 1964). This association also represents the largest continuous assemblage of Vertisols in the world (Dudal, 1965). These soils have no distinct "B" horizon. The transition is from "A" to "AC". They share fine montmorillonitic basic, thermic and ustertic properties.

This soil is characterized by shrink-swell properties which result in development of broad, deep cracks. Movement of the soil gives rise to a characteristic microrelief of low mounds and shallow depressions referred to as gilgai. On slopes of less than 5% gilgai topography is characterized by circular micro-depressions while on slopes greater than 5% it consists of continuous curving banks and depressions aligned approximately parallel to the maximum slope (Beckman et al. 1970).

Wilson-Crockett-Burleson Association

These soils, derived from the Midway Group, are dominant in the northern and eastern portion of the Prairie. The Wilson series (Alfisol) typifies soils in this association which are loamy in the surface; the Burleson series (Vertisol) typifies the ones which are clayey throughout (Godfrey, 1964). These are neutral to slightly acid gray, loamy and clayey soils usually characterized by massive, very hard fine sandy loam "A" horizon, a hard mottled clay "Bt" horizon and an olive "C" horizon.

METHODOLOGY

A survey was conducted in 1970 to determine the extent and distribution of remnant native vegetation in the Blacklands. All remnants reported were upland hay meadows. Each remnant was considered to be one stand unless topographic or edaphic factors warranted its division. To be selected a stand must: (1) have unbroken native sod; (2) be large enough that vegetation was not affected by agronomic treatments or other edge effects; (3) exhibit visual homogeneity of vegetation; (4) be ungrazed during the growing season; (5) not be mowed more than once during the growing season; (6) never have been interseeded; and (7) have no history of herbicide treatment. Of the 360 remnants reported, 83 satisfied these criteria. Stand size varied from 2 to 500 ha but most were about 20 ha.

These remnants were considered representative of climatic and edaphic variations across upland sites within the Blacklands. Many factors such as mowing, grazing and fire have differential effects upon vegetation composition and production (Dix, 1964; Smeins, 1972). However, there is little doubt that hay meadows are the best remaining approximation of the climax vegetation of the Blackland Prairie (Tharp, 1926; Johnston, 1931). All meadows are mowed annually in late June or early July. This time of cutting not only allows most of the vegetation to develop beyond the critical early spring growth period, but is prior to seedstalk formation of the major grasses so that after removal of hay, plants make new growth and complete their life cycle.

Basal cover and species frequency were measured in each stand. All samples were taken between May 10 and July 20, 1971. Sampling was initiated in the southernmost portion of the Blacklands and progressed northward to minimize phenological variation. Frequency of all species was determined by taking 30 rectangular 0.5 m^2 (100 x 50 cm) quadrats per stand similar to techniques employed by Nicholson and Hulett (1970). Basal cover was measured with 300 single vertical point quadrats per stand (Goodall, 1952). Quadrats and point quadrats were positioned in a stratified random manner throughout each stand. Samples of 30 quadrats and 300 points were arrived at by intensively sampling one stand to determine the adequate sample number for dominant species.

Taxonomic nomenclature follows (Correll and Johnston, 1970). Varietal appellations are only used for the genus *Sporobolus*.

Soil samples approximately 10 x 10 x 38 cm were taken of the solum from a representative location in each stand and analyzed for texture by the hydrometer method, pH and available water (1/3–15 bars) using the matrix suction method. Soil profiles for selected stands within each soil association were described in the field with the help of Soil Conservation Service soil scientists.

RESULTS

In addition to field observations, a number of measured vegetation variables were considered in an attempt to quantitatively delimit community types within the Blacklands. Percent composition of dominant species based on basal cover produced an effective single factor mechanism for consistent and rapid recognition of communities in the field. Frequency of dominant and secondary species and composition by weight for selected stands, although not reported here, provided additional support for identification of communities. A key was developed utilizing basal cover to distinguish seven community types which were named after dominant genera (usually only one species per genus) (Fig. 2).

Community types and species distribution related closely to edaphic, topographic and climatic variables. North-south boundaries are located on major streams since species distribu-

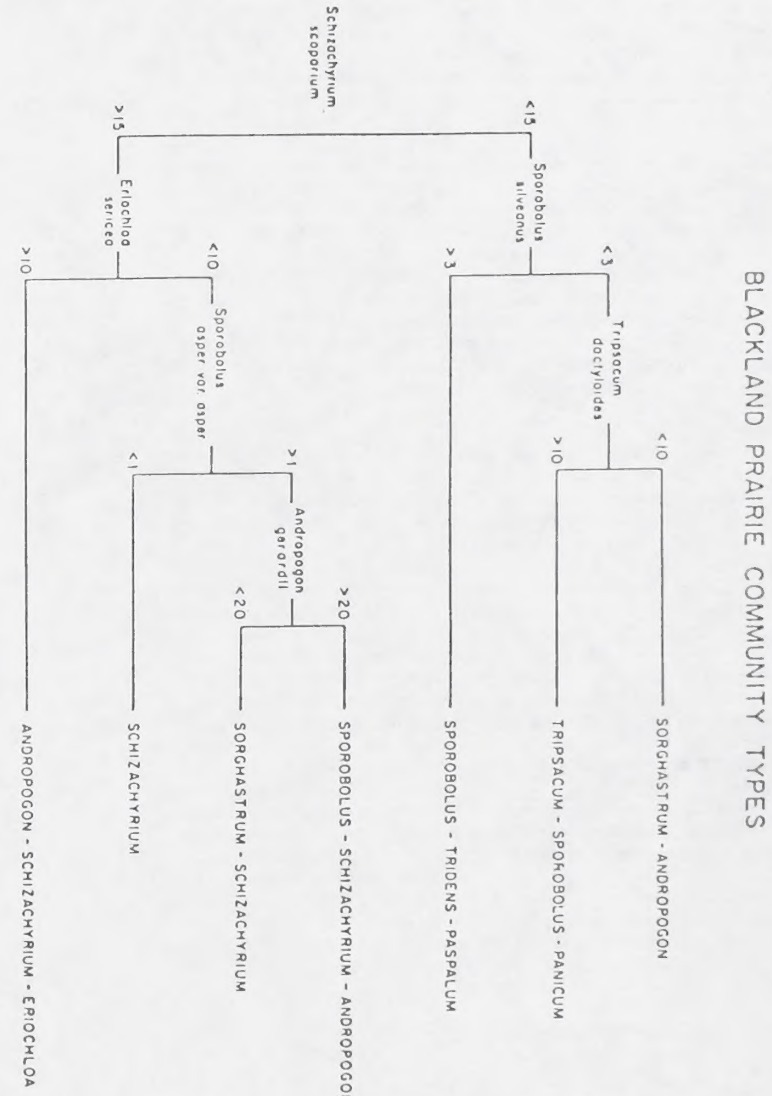

Fig. 2. Key to Blackland Prairie community types. Numbers represent percent composition based on basal cover.

tion tended to coincide with the position of rivers. However, there is also a continuous decline in annual precipitation from north to south which influences the vegetation pattern and produces a gradual rather than abrupt change.

East-west divisions are established by soil association boundaries. Some physical soil characteristics are presented in Table 1. The Austin-Stephen-Eddy and Houston-Heiden-Ferris associations are characterized by high clay and silt textural fractions, pH values of 7.8 and 7.7 and similar moisture retention characteristics. The Wilson-Crockett-Burleson association has a high silt content, more sand than the other associations, an average pH of 6.4 and a moisture retention similar to the other associations.

Map units are to some extent artificial and serve primarily to show the area within which a particular community type is the prevalent kind of vegetation. There are, of course, varying degrees to continuity between types and a type may occur outside the mapped boundary, but in this case it would be a minor part of the total vegetation.

Sporobolus-Schizachyrium-Andropogon type

This type was found between the Colorado and Trinity Rivers on soils of the Austin-Stephen-Eddy association (Fig. 1). It was the most xeric type in the Blackland Prairie. Average annual precipitation varied from 75 cm/yr on the southern boundary to 95 cm/yr along the Trinity River. Basal cover values for dominants were: *Andropogon gerardii* (35%), *Schizachyrium scoparium* (31%) and *Sporobolus asper* var. *asper* (19%) (Table 2).

Scattered clones of *Sorghastrum avenaceum* were encountered, but rarely covered a significant area. *Bouteloua curtipendula* was more abundant (3%) than in any other area within the Prairie. This was the only community type where *Bothriochloa saccharoides* and *Bouteloua curtipendula* could be considered climax components. It was observed that grazing or mowing too close or too often was followed by a marked increase in composition of *Bothriochloa saccharoides* and *Stipa leucotricha*, similar to their behavior as increasers in the Fort Worth Prairie (Dyksterhuis, 1946).

Sorghastrum-Andropogon type

This type occupied the Austin-Stephen-Eddy soils north of the Trinity River and was dominated by *Sorghastrum avenaceum* (47%) and *Andropogon gerardii* (38%) (Table 2). Average annual precipitation varied from 96 cm/yr at the southern boundary to 115 cm/yr near the Red River. *Schizachyrium scoparium* and *Sporobolus asper* var. *asper* decreased as precipitation increased and were replaced by *Sorghastrum avenaceum* and *Andropogon gerardii*. *Panicum virgatum* and *Tripsacum dactyloides* occurred as infrequent clones in swales or low areas. *Bouteloua curtipendula* and, to a lesser degree, *Schizachyrium scoparium*, increased with disturbance and were observed to be characteristic of meadows mowed too close ot too frequently.

Schizachyrium-Andropogon-Eriochloa type

This type extended from the Colorado to the Brazos River on Houston Black-Heiden-Ferris soils and was dominated by *Andropogon gerardii* (33%), *Schizachyrium scoparium* (37%) and *Eriochloa sericea* (22%) (Table 2). Average annual precipitation varied from 75 to 85 cm/yr. *Andropogon gerardii* decreased as precipitation increased, while *Sorghastrum avenaceum* increased. It was observed that *Eriochloa sericea* was more abundant on the gravelly phase of Houston soils.

When *Sorghastrum avenaceum* was observed in this community type it occurred as segregated clones. The delineation between clones of *Sorghastrum avenaceum* and a mixture of *Andropogon gerardii* and *Schizachyrium scoparium* clones was quite pronounced. *Bothriochloa saccharoides* was observed to be an indicator of overgrazing or mowing too close within this

Table 1. Some physical characteristics of Blackland Prairie soils

	Soil associations					
	Austin-Stephen-Eddy		Houston Black-Heiden-Ferris		Wilson-Crockett-Burleson	
Number of samples	15		37		31	
	Mean	Range	Mean	Range	Mean	Range
Soil characteristics						
Texture (%)						
Sand	2	0- 5	2	0- 4	14	9-24
Silt	43	37-48	37	29-41	55	48-60
Clay	55	48-61	61	56-66	31	27-34
Moisture retention (%)						
15 bars	21	16-27	43	34-50	13	8-20
1/3 bars	35	32-40	60	54-67	28	22-31
Available	14	12-16	17	15-21	15	13-19
pH	7.8	7.7-7.8	7.7	7.6-7.9	6.4	5.0-6.9

Table 2. Average species composition (%) based on basal cover in relation to soil associations and precipitation. Only species with greater than 20 percent basal cover in at least one stand are included.

	Soil associations											
	Austin-Stephen-Eddy				Houston Black-Heiden-Ferris				Wilson-Crockett-Burleson			
Average annual precipitation (cm)	75-85	86-95	96-105	106-115	75-85	86-95	96-105	106-115	75-85	86-95	96-105	106-115
Number of stands	3	4	3	5	11	12	10	4	5	6	6	14
SPECIES												
Andropogon gerardii												
Mean	31	39	32	44	33	9	-	1	4	-	-	-
Range	28-36	33-48	18-45	36-48	27-42	6-15	-	0- 3	0- 6	-	-	-
Eriochloa sericea												
Mean	-	-	-	-	22	4	-	-	-	-	-	-
Range	-	-	-	-	12-27	0-15	-	-	-	-	-	-
Panicum virgatum												
Mean	-	-	-	1	-	-	14	16	-	-	-	-
Range	-	-	-	0- 6	-	-	0-30	9-21	-	-	-	-
Paspalum floridanum												
Mean	-	-	-	-	-	-	-	-	5	9	9	17
Range	-	-	-	-	-	-	-	-	1- 9	3-18	0-24	6-27
Schizachyrium scoparium												
Mean	27	35	16	4	37	23	-	-	81	37	26	-
Range	21-33	30-42	6-24	0-9	30-48	9-36	-	-	64-92	33-48	21-30	-

Table 2 (continued)

	Soil associations											
	Austin-Stephen-Eddy				Houston Black-Heiden-Ferris				Wilson-Crockett-Burleson			
Average annual precipitation(cm)	75-85	86-95	96-105	106-115	75-85	86-95	96-105	106-115	75-85	86-95	96-105	106-115
Number of stands	3	4	3	5	11	12	10	4	5	6	6	14
SPECIES												
Sorghastrum nutans												
Mean	4	23	45	49	5	40	3	-	6	43	54	4
Range	0- 6	21-27	42-52	45-57	0-18	27-59	0-12	-	0-24	33-57	45-66	0-15
Sporobolus asper var. asper												
Mean	35	2	-	-	-	12	45	43	-	-	-	-
Range	27-42	0- 9	-	-	-	0-33	27-60	36-57	-	-	-	-
Sporobolus silveanus												
Mean	-	-	-	-	-	-	-	-	-	-	1	57
Range	-	-	-	-	-	-	-	-	-	-	0- 6	15-82
Tridens strictus												
Mean	-	-	-	-	-	-	-	-	-	-	3	21
Range	-	-	-	-	-	-	-	-	-	-	0- 6	12-33
Tripsacum dactyloides												
Mean	-	-	-	1	-	9	27	38	-	-	-	-
Range	-	-	-	0- 6	-	0-24	18-39	33-48	-	-	-	-

LETTER 38 (CONTINUED)

community type.

Sorghastrum-Schizachyrium type

This type extended from the Brazos to the Sabine River on the Houston Black-Heiden-Ferris soils and from the Trinity to the Sabine River on the Wilson-Crockett-Burleson soils. Basal cover values for *Sorghastrum avenaceum* and *Schizachyrium scoparium*, the dominant species in this type, were 39 and 32% on the acid soils. On basic soils their basal cover values were 40 and 23% (Table 2). This was the only type to cross two soil associations. Average precipitation on the Houston Black-Heiden-Ferris soils varied from 86 to 95 cm/yr and from 86 cm/yr to 105 cm/yr on the Wilson-Crockett-Burleson soils. The dominant species, *Sorghastrum avenaceum* and *Schizachyrium scoparium*, were of approximately equal importance on each soil association. The only striking difference between soil associations was that *Sorghastrum* did not occur as restricted clones on the Wilson-Crockett-Burleson soils while this segregated clonal pattern was common on Houston Black-Heiden-Ferris soils. *Tripsacum dactyloides* was observed in gilgai microlows in this type.

Tripsacum-Sporobolus-Panicum type

Dominated by *Tripsacum dactyloides* (38%), *Sporobolus asper* var. *asper* (29%) and *Panicum virgatum* (15%), this type was found on the Houston Black-Heiden-Ferris association north of the Sabine River. Average annual precipitation varied from 96 to 115 cm/yr. These three dominants were primary components throughout this type and all increased with increasing precipitation. All occurred equally throughout the area and showed little preference for gilgai microlows or knolls. This was in direct contrast with the distribution pattern of *Tripsacum dactyloides* and *Panicum virgatum* in other communities where they occurred in microlows. The vernal aspect of this community type was marked by *Elymus canadensis*. *Schizachyrium scoparium* was observed to increase with disturbance, responding much like *Bothriochloa saccharoides* in the *Sporobolus-Schizachyrium-Andropogon* type.

Maclura pomifera, a woody species, occurred on all community types in high precipitation areas, but was especially abundant in this community type.

Sporobolus-Tridens-Paspalum type

This type was situated on Wilson-Crockett-Burleson soils north of the Sabine River. Average annual precipitation varied from 106 to 115 cm/yr. Basal cover for dominants was *Sporobolus silveanus* (57%), *Tridens strictus* (21%), and *Paspalum floridanum* (17%) (Table 2). As *Sorghastrum avenaceum* and *Paspalum floridanum* decreased in percent basal cover with decreased precipitation, *Tridens strictus* and *Sporobolus silveanus* increased. This community type was dominated by species that in other types were subordinates.

Sporobolus silveanus has not previously been reported as an important grassland dominant but in the northeastern Blacklands it often formed monodominant stands. *Tridens strictus* often comprised over 20% of the composition. *Paspalum floridanum* contributed 17% of the vegetation in this type (Table 2). While *Tridens strictus* and *Paspalum floridanum* were often codominants with *Sporobolus silveanus* they seldom grew together in abundance. There was a distinct strata of low-growing species dominated by *Panicum linearifolium*, *P. angustifolium* and *P. oligosanthes*, *Aira elegans*, *Eragrostis hirsuta* and the rare (in Texas) *E. capillaris*.

Mima mounds were abundant in many portions of the area covered by this community type and vegetation on these mounds differed markedly from the general community. Where the mounds were not mowed, an almost zonal 3-part community was observed. Dominating the upper one-third of the mound was *Andropogon gerardii*. This was unusual because the only other habitat it was observed to frequent in the *Sporobolus-Tridens-Paspalum* type were microlows running perpendicular to the slope. The center section of the mounds was dominated by

Tridens strictus and the lowest section of the mound did not deviate noticeably from the majority of the meadow.

When the mounds were mowed yearly a different vegetation type occurred probably because it was impossible to control correct cutting height when traversing the mima mounds. Again a 3-part zonal vegetation was observed. The upper section of the mounds was dominated by *Chloris verticillata*, *Aristida oligantha* and *Cenchrus incertus*. The central part of the mound was dominated by *Andropogon ternarius* while the bottom again differed little from the rest of the meadow.

Andropogon ternarius was a characteristic indicator of mowing severity or overgrazing. *Juniperus virginiana* was a woody species observed to be associated with communities in the early stages of succession and *Maclura pomifera* occurred as scattered motts in native hay meadows within this type.

Schizachyrium type

This community type was found on Wilson-Crockett-Burleson soils between the Trinity and Colorado Rivers. Average annual precipitation varied from 75 cm/yr along the Colorado River to 95 cm/yr at the Trinity. *Schizachyrium scoparium* was the sole dominant here, composing 81% of the vegetation based on basal cover (Table 2). *Andropogon gerardii*, *Sorghastrum avenaceum*, *Paspalum floridanum* and *Manisuris cylindrica* were found in all stands. *Bouteloua curtipendula*, *Eriochloa sericea* and *Stipa leucotricha* often were found within this type.

DISCUSSION

The grassland formation of North America is generally divided into seven major associations (Dodd, 1968). The Blackland Prairie, due to its location, climate and vegetational characteristics, could be considered part of either the True Prairie or Coastal Prairie associations.

Climatically, the True Prairie, in its southern extension, receives between 75 and 100 cm/yr precipitation; the Coastal Prairie receives 65 to 85 cm/yr. The Blacklands receive 75 to 115 cm/yr and thus could be considered within the precipitation range of either of the associations. Geographically the Blackland Prairie is situated at the very southern end of the True Prairie, but it is also, through a series of outlier grasslands (Godfrey et al. undated), continuous southward to the Coastal Prairie.

Vegetationally the True Prairie is characterized by 7 major dominant species: *Stipa spartea*, *Sporobolus heterolepis*, *Schizachyrium scoparium*, *Andropogon gerardii*, *Panicum virgatum*, *Elymus canadensis* and *Spartina pectinata* (Weaver, 1954). The Coastal Prairie, although not thoroughly investigated, is characterized by *Bothriochloa saccharoides*, *Stipa leucotricha*, *Schizachyrium scoparium* var. *littoralis*, *Andropogon gerardii*, *Sorghastrum avenaceum* and several species of *Panicum* and *Paspalum* (Weaver and Clements, 1938).

The Blacklands have most dominants of the True Prairie except *Stipa spartea*, *Sporobolus heterolepis* and *Spartina pectinata* and they contain all species of the Coastal Prairie, however, *Bothriochloa saccharoides* and *Stipa leucotricha* are considered disturbance, not climax, species in the Blacklands.

Species of minor significance as dominants in either the True or Coastal Prairies, but which become major dominants in the Blacklands are *Eriochloa sericea*, *Paspalum floridanum*, *Sorghastrum avenaceum*, *Sporobolus asper* var. *asper*, and *Tripsacum dactyloides*, while *Sporobolus silveanus* and *Tridens strictus* are unique as major dominants within portions of the Blacklands. Thus, the Blackland Prairie has elements of both associations and also contains species combinations and certain species that make it a distinctive grassland.

An apparent factor in comparing dominant species of the Blacklands with the True and Coastal Prairies is that nearly all species are tall grasses and the communities are physiognomically similar to lowlands of the True and Coastal Prairie. In terms of precipitation and soil moisture retention characteristics, the Blacklands are humid in nature. Consequently, the Prairie takes on a lowland grassland appearance even on upland, well-drained situations. Also, the gilgai microtopography influences this relationship by acting to retain water. The influence is well illustrated by *Tripsacum dactyloides* which is a dominant in the northern, high precipitation *Tripsacum-Sporobolus-Panicum* community type but southward into drier portions of the grassland it becomes more restricted to gilgai microlows until it eventually disappears.

To place the Blackland Prairie into either the True or Coastal Prairie association is still somewhat questionable. If the most extensive community type is used as the main criterion, this type, the *Sorghastrum-Schizachyrium* type, doesn't fit well into either of the associations. Launchbaugh (1955) considered the San Antonio Prairie, which lies between the Blacklands and the Coastal Prairie and which is dominated by *Schizachyrium scoparium*, to be part of the True Prairie. If so, the Blacklands might also logically be placed in the True Prairie.

Data available do not adequately help to properly classify the Blacklands. Lack of data from the Coastal Prairie makes comparisons with it difficult. Presence of certain community types within the Blacklands, particularly the *Sporobolus-Tridens-Paspalum* type, which are unique to this grassland, tend to separate it from the other Prairies while many communities would present logical ties to both the True and Coastal Prairies.

Another possibly is that some of the northern more humid types, particularly the *Tripsacum-Sporobolus-Panicum* type, may be part of the Tall Grass Prairie as described by Weaver and Clements (1938). They included as dominants *Andropogon gerardii, Sorghastrum avenaceum, Schizachyrium scoparium, Elymus canadensis, Panicum virgatum* and less frequently *Sporobolus asper*. This then also closely resembles at least portions of the Blacklands.

It appears the Blackland Prairie has elements of the True and Coastal Prairies, of the Tall Grass Prairie and some unique elements of its own. Further investigations of the total floristics of the Blacklands, and more complete data from the Coastal Prairie may ultimately provide the necessary information for placement of the Blacklands. Nonetheless, the Blackland Prairie of Texas was once an extensive grassland region of North America and today has been nearly erased as a vegetation type. Continued investigation of the ecology of its remnants may not only elucidate its ecological ties to other grassland, but provide understanding for more proper management and maintenance of this grassland.

ABSTRACT

The Blackland Prairie of Texas is described with emphasis focused upon relationship of major community types, soil associations and precipitation pattern. The authors recognize three major soil associations, upon which are distributed seven major community types. East-west community boundaries are primarily defined by soil associations, while north-south boundaries tend to coincide with divisions produced by major streams and a precipitation gradient. A key to community types of the Blackland Prairie is presented. The Blacklands are compared to other grasslands of North America and are shown to have characteristics of the True, Coastal and the Tall Grass Prairies, as well as some unique communities not previously reported.

KEY WORDS

Blackland Prairie, Coastal Prairie, plant communities, grasslands, Tall Grass Prairie, Texas, True Prairie.

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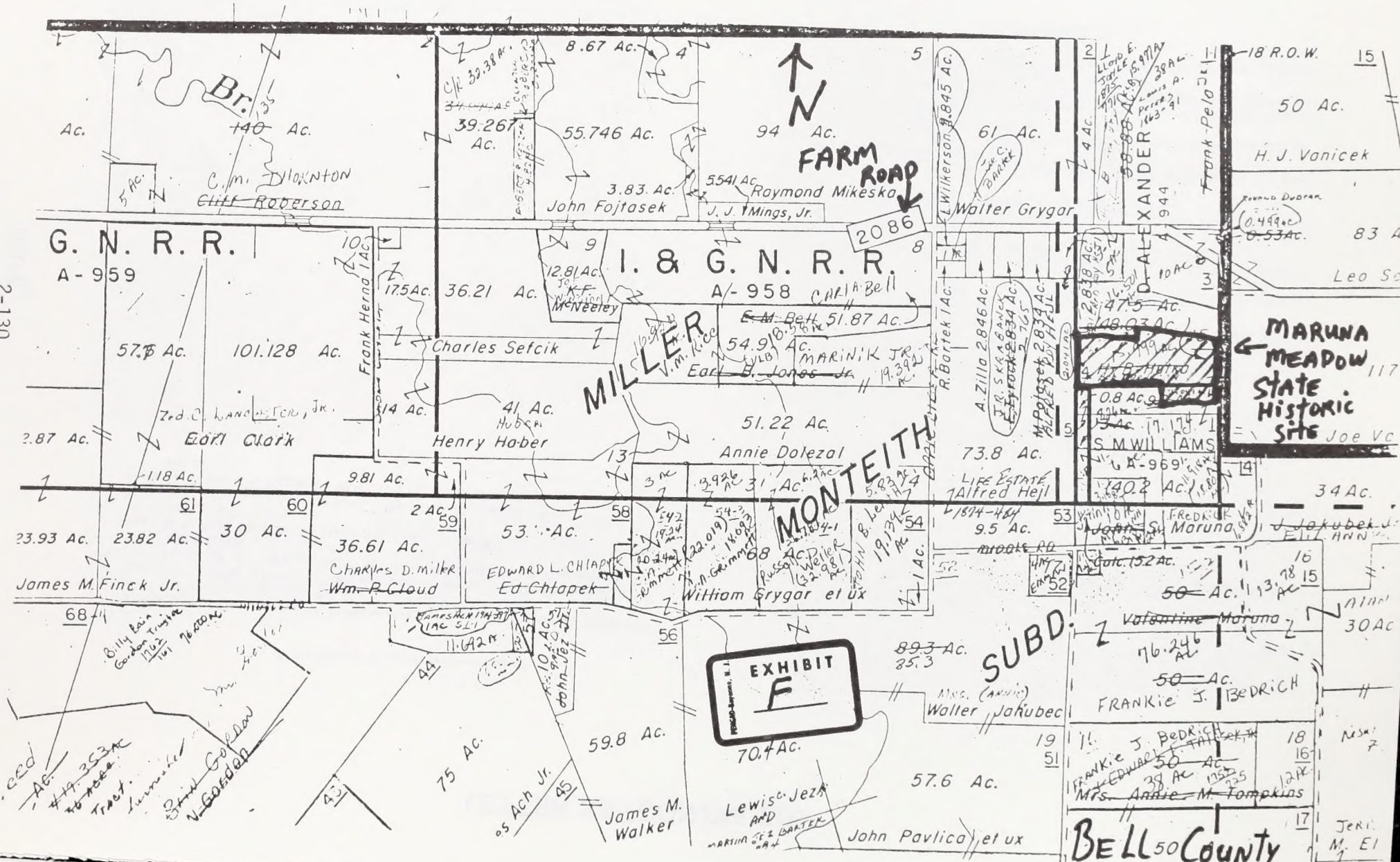
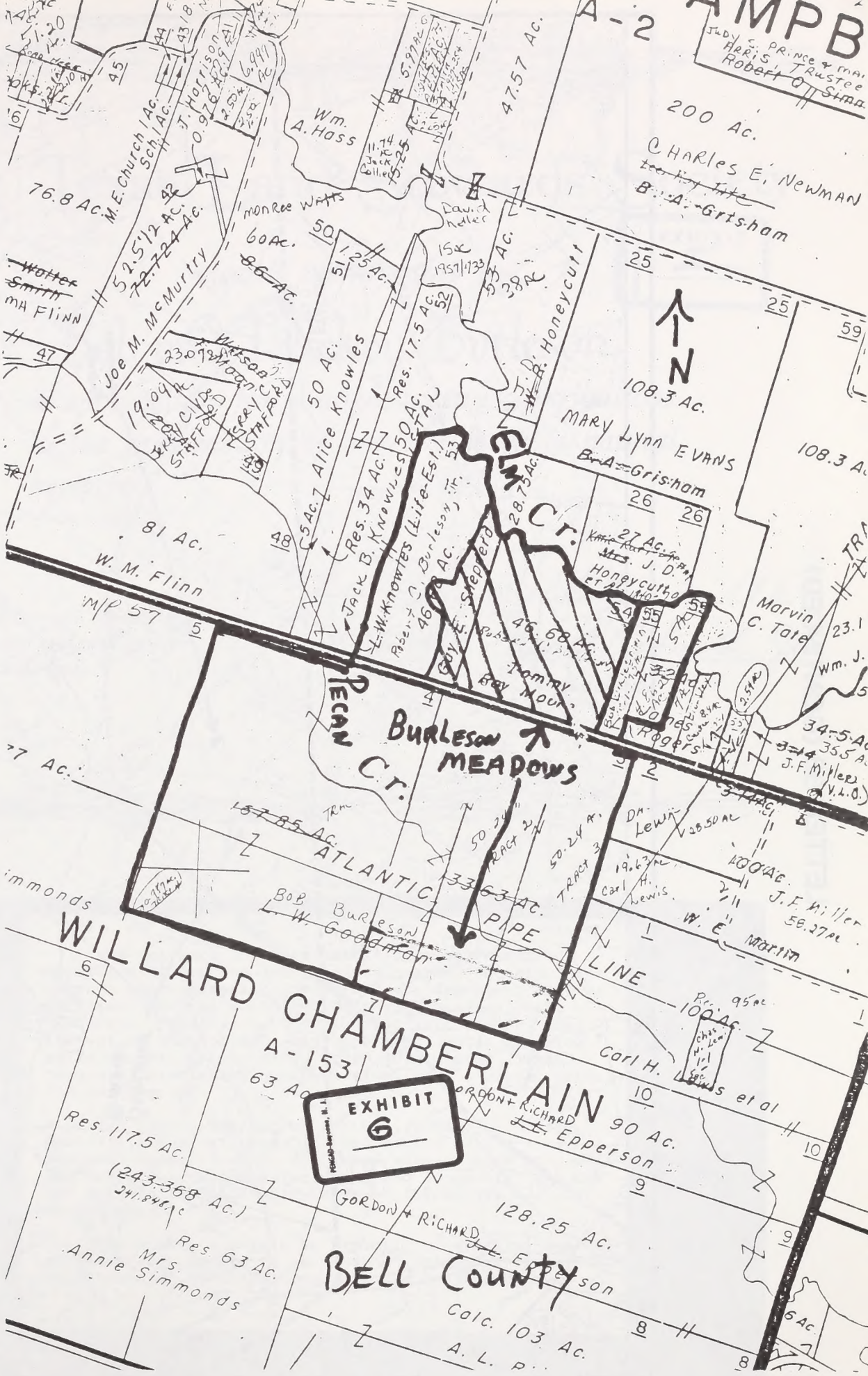
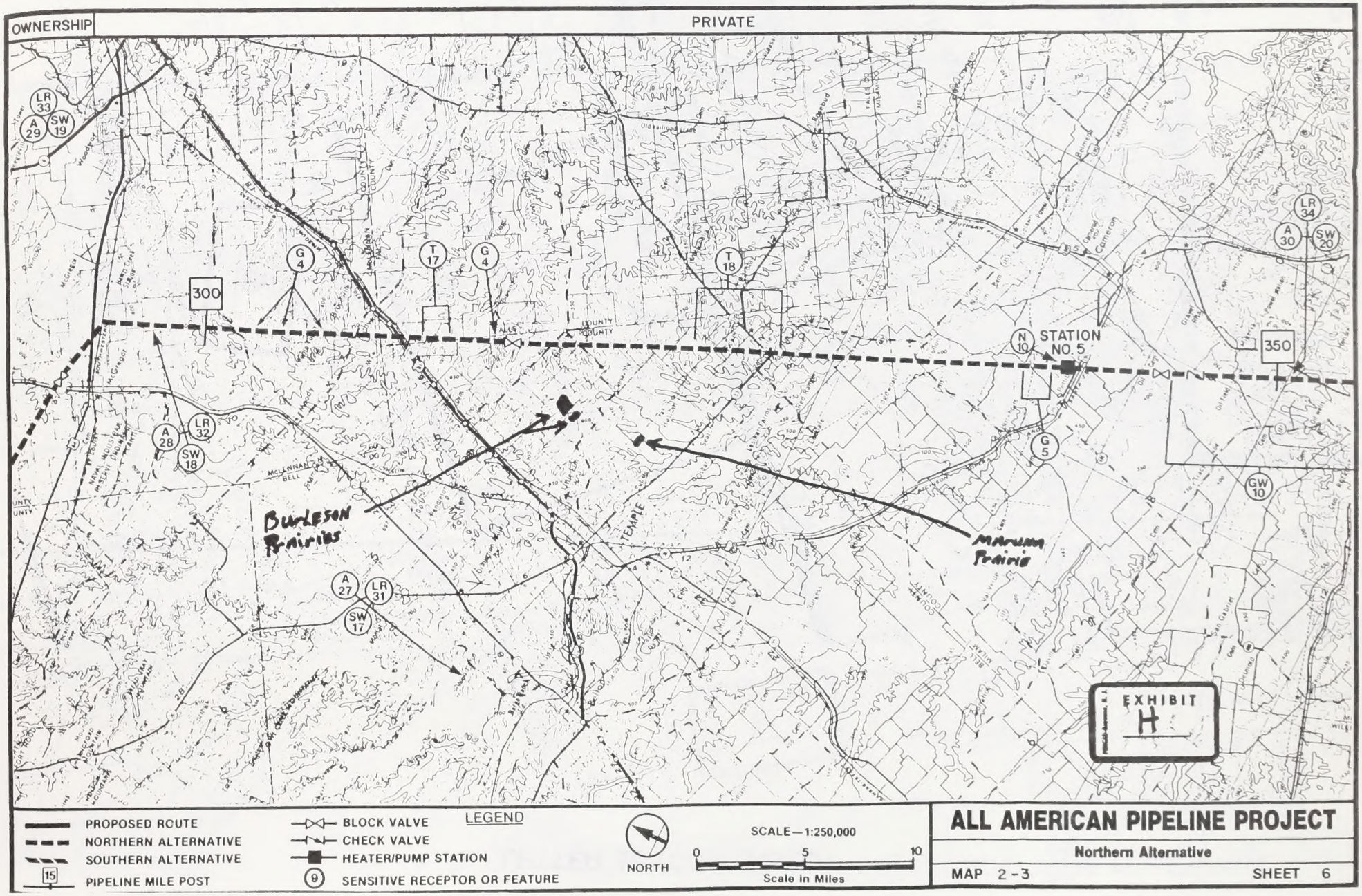

G. N. R. R.
A-959
I. & G. N. R.
A/-958
MILLER
MONTEITH
SUBD.
FARM ROAD 2086
N
MARUNA MEADOW State Historic Site
EXHIBIT F
BELL COUNTY
Br.
C. M. DILLINGTON
Cliff Robertson
Earl Clark
Henry Haber
Charles Setcik
Frank Herna
Charles D. Miller
Wm. P. Cloud
Edward L. Chlapek
Ed Chlapek
William Grygar et ux
Annie Dolezal
Raymond Mikeska
John Fojtasek
J. J. Mings, Jr.
Walter Grygar
Alfred Hejl
Life Estate
Frank Pelo
H. J. Vanicek
Leo So
Joe Vc
S. M. WILLIAMS
A-969
Joan St. Maruna
Valentine Maruna
FRANKIE J. BEDRICH
Mrs. Annie M. Tompkins
Walter Jakubec
Lewis Jezek AND Martin Jez & Barter
John Pavlica et ux
James M. Walker
James M. Finck Jr.
Billy Bain Gordon Trustee
Frank Golden
Joe Ach Jr.
Frank Alexander
Frank Pelo
Russell Weller
Emmett Grimmer
John B. Lewis
Lloyd E. Jones
Louis A. Perez
Frederick
Edward Bedrich
Frankie J. Bedrich
Mrs. (Annie) Walter Jakubec
Joe C. Barker
Raymond Dubcak
Gotc. 15.2 Ac.
Middle Rd
18 R.O.W.
50 Ac.
83 Ac.
34 Ac.
30 Ac.
140 Ac.
39.267 Ac.
55.746 Ac.
94 Ac.
61 Ac.
101.128 Ac.
36.21 Ac.
51.87 Ac.
54.91 Ac.
51.22 Ac.
73.8 Ac.
9.5 Ac.
36.61 Ac.
53 Ac.
68 Ac.
30 Ac.
23.82 Ac.
23.93 Ac.
75 Ac.
59.8 Ac.
70.4 Ac.
57.6 Ac.
76.246 Ac.
38 Ac.
50 Ac.
8.67 Ac.
3.83 Ac.
9.81 Ac.
41 Ac.
17.5 Ac.
12.81 Ac.
2.87 Ac.
1.18 Ac.
2 Ac.
14 Ac.
10 Ac.
4 Ac.
0.8 Ac.
0.499 ac.
0.53 Ac.
11.692 Ac.
10.242 Ac.
2.838 Ac.
2.834 Ac.
2.846 Ac.
2.873 Ac.
19.392 Ac.
19.134 Ac.
13.926 Ac.
13.78 Ac.
47.5 Ac.
48.03 Ac.
17.174 Ac.
14.02 Ac.
89.3 Ac.
85.3

LETTER 38 (CONTINUED)




OWNERSHIP
PRIVATE
STATION NO. 5
BURLESON Prairies
MARUM Prairie
TEMPLE
EXHIBIT H
LEGEND
PROPOSED ROUTE
NORTHERN ALTERNATIVE
SOUTHERN ALTERNATIVE
PIPELINE MILE POST
BLOCK VALVE
CHECK VALVE
HEATER/PUMP STATION
SENSITIVE RECEPTOR OR FEATURE
NORTH
SCALE—1:250,000
Scale in Miles
ALL AMERICAN PIPELINE PROJECT
Northern Alternative
MAP 2-3
SHEET 6

LETTER 38 (CONTINUED)

The Texas Land Stewards' Society

EXHIBIT I

awards membership to

Bob and Mickey Burleson

in appreciation for your distinctive contributions to the preservation of our irreplaceable natural heritage.

The Texas Land Stewards' Society is an honorary society sponsored by the Texas Nature Conservancy.

October 2, 1982
Date

Frank C. Smith, Jr.
President
Texas Nature Conservancy

The art work for this certificate was designed specifically for the Texas Land Stewards' Society. The grasses which comprise the border are important natives to Texas, natives which dominated the presettlement landscape. Clockwise, from the top left corner, they are yellow Indiangrass, big bluestem, little bluestem, buffalograss, black grama, green sprangletop, Texas cupgrass, blue grama, eastern gamagrass, sideoats grama, and switchgrass.

The laurel wreath, an ancient symbol of victory, nobility and excellence, is composed of native mountain-laurel leaves, decorated with a Texas oak leaf. The oak tree symbolizes strength and longevity, and the oak leaf is the national emblem of the Nature Conservancy.

The wreath's circle is symbolic of eternity and expresses our desire to see that the elements of our Texas natural heritage are protected in perpetuity.

EXHIBIT J

HISTORY OF THE MARUNA MEADOW

By Bob Burleson
Box 844
Temple, Texas 76503

The meadow is composed of two adjoining tracts (only because they were purchased at different times by the present owners) these tracts containing 15.999 acres and 2.041 acres. The larger tract is in the D. Alexander Survey, Abstract No. 944, Bell County, and the smaller is in the S. M. Williams Survey, Abstract No. 969, Bell County. Both were patented by the State of Texas in the 1870's. (1)

The early title shows a good bit of activity, including a lawsuit with claimants of the Maximo Moreno 11 League Grant, a title derived from Mexico, but there is no indication of the land actually ever being settled or altered from its open-range prairie status until the subdivision of the lands by Miller and Monteith of Belton, Texas, for the purpose of selling farmsteads to Czech emigrants.(1) Ultimately, the Maruna Meadow owes its preservation to the fact that it was sold to Czech people who had a history of preservation of "hay meadows" for winter fodder for their animals during the long European winters.

While the land was still open range, A. J. Harris acquired about 1800 acres of prairie on the Big Elm Creek, includuing the present meadow site. Harris got into financial trouble, and on February 1, 1904, Harris conveyed to Joe Zack Miller, Jr. and A. M. Monteith, Belton bankers and investors, this 1800 acres of land. On April 1, 1904, Miller and Monteith filed a plat of a subdivision of these lands, they having cut it up into farm-sized plots.(1) (2)

The first Czechoslovakians to settle in Bell County arrived about 1881 and settled near present Seaton, a few miles south of the Maruna Meadow. They were looking for fertile farmlands such as they knew from the "Old Country" and found what they were looking for in the millions of acres of rolling Blackland Prairie. Numerous Czech settlements were established in East Bell County during the next twenty years, and the Miller and Monteith Subdivision was aimed at the thrifty Czech emigrants, who were not concerned that Texans were saying the prairie was too devoid of water and the sod too tough to ever settle as a farming area. The Czechs dug wells, hauled water or caught it off their roofs and stored it in cisterns underground, and made the prairie their home.(2) (3)

The original name for the area around the Maruna Meadow was "Lost Prairie", and the community took the name "Seaton" only because the U. S. Postal Service insisted. The Lost Prairie School, founded in 1894, was about two miles east of the meadow, and still exists as a community center.(4) The first settlers to come to Lost Prairie, in ox carts, were Frank and Vinc Motl, the Matula family, E. Bartek, John Holua, Paul Reznicek and John Vasek. They all came in 1881. In 1883 other Czech families came to Lost Prairie, including the Lesikar brothers, John Hruska and Joe Simek.

Joe Simek was the first purchaser of the Maruna Meadow after Miller and Monteith subdivided the Harris rangeland. He purchased a 60-acre farmstead on October 31, 1904. Other Czech farmers purchased the adjoining lots as evidenced by the names A. W. Hruska, John Mucha and Metes Sana. (1)

The Bell County land ownership map of about 1915 shows that the area of the Maruna Meadow was totally a part of the Lost Prairie Czech community. Owners of adjoining or nearby tracts were, at that date, exclusively Czech: John Maruna, Metes Sana, John Grygar, Anna Sefcik Juricek, Tom Luksa, Marvin Vanicek, George Labaj, John Bartek, John Jacubec and E. Elsik.(1) The small community just west of the meadow was also a part of the Harris Ranch, and was called "Double Header".(4)

Joe Simek acquired other nearby land, and on June 9, 1914, he conveyed the Maruna Meadow tract to John Maruna. From that date forward, John Maruna and his son, John S. Maruna, continuously owned and managed the hay meadow and preserved it from the plow and cow. Every other piece of prairie around it was turned into farmland, but this small tract was kept by the Maruna family and carefully tended to insure its survival as a source of "prairie hay".(5)

"Prairie hay" is the term given to hay made from the native bluestem grasses that made up the Blackland Prairie of Central Texas. All farming until about the 1930's was done with mule or horse teams. This prairie hay was the preferred fodder for draft animals.(5) Small hay meadows were preserved all over the Czech-settled areas of Bell County, and many of them survived until the 1970's, when high grain prices and the passing of the older generation resulted in their being finally plowed up for use as farmland. The Maruna Meadow is now one of only a handful that survived the final plowup of the 1970's.(6) (7)

Why did the Maruna Meadow survive, and in such good condition? Credit must be given to John S. Maruna and his wife, Mary, both now deceased. When the present owners, Bob and Mickey Burleson, first encountered this meadow in about 1970, and started studying the plant communities of the Blackland Prairie that were preserved in the meadow, John S. Maruna and Mary were still owners of the south part of the meadow and still "tended to" the whole of

it. The Burlesons were able to interview the Marunas concerning their historical uses of the meadow, and the care it received. The Marunas were aware that the tall prairie grasses could not stand being fenced in and subjected to continual grazing, and the meadow was never fenced until very recent times. In fact, part of it is still unfenced. The Marunas also knew that too frequently cutting the meadow for hay would eventually weaken the tall grasses and degrade the meadow and the quality of its forage. Over the years from 1914 to the deaths of John S. Maruna and Mary in the early 1980's, they made a practice of cutting hay only once yearly, usually about the 4th of July, giving the meadow a full growing season to rest and recover before the next year's hay crop was cut. Only in unusually wet years, when the meadow could stand a "double cutting" was the grass cut twice.(5)

Even after Mary Maruna, then in her 80's, could hardly totter, she still reguarly went over the meadow with a pair of pruning shears, cutting out any invading woody growth such as mesquite, wild plum or cedar elm, because "the trees will harm the meadow if you don't keep the saplings cut out."(5)

All of the cultural practices of the Marunas were biologically sound, and resulted in the preservation of the greatest variety of species of prairie plants. No herbicides were ever used on the Maruna Meadow, and it was never fertilized. It is as near to the original Blackland Prairie as one can find anywhere in Bell County.

From a botanical standpoint, the Maruna Meadow is interesting not only for its species diversity (over 100 species of grasses, forbs and legumes) but also because it is a "hog wallow" prairie containing numerous natural depressions or gilgai, a result of the unique "self swallowing" action of the vertisols of the Blackland Prairie.(6)

The Burlesons purchased the Maruna Meadow strictly to preserve it. It took a lot of love of a prairie plot to justify the $20,000 that was spent to acquire about 19 acres of land, but it is 19 acres that cannot be duplicated -- the product of hundreds of thousands of years of development of blackland soil under tallgrass prairie. Almost all of the Blackland Prairie is gone, destroyed by plow or cow, and this is one of the best of the few remaining sites that illustrate what the first settlers of Bell County must have seen -- a sea of grasses and wildflowers.(6) (7)

Bob Burleson

BOB BURLESON

(1) Abstract of Title from the sovereignty of the soil to October 31, 1977, by Bell County Abstract Company, Belton, Texas, 181 pages.

(2) History of Bell County, by George W. Tyler, 1936, reprinted 1966 by Texian Press, Waco, pages 294, et seq.

(3) Bell County Revisited, by Martha Bowmer, Temple Jaycees, 1976, pages 243, et seq.

(4) History of Bell County Public Schools 1854-1976, by Neal, et al, 1976, pages 276, et seq.

(5) Interview by Bob Burleson with Mary Maruna, 1975.

(6) The Blackland Prairie, masters thesis, Odell Brown Collins, Texas A & M University, 1972.

(7) The Blackland Prairie of Texas: Conservation of Representative Climax Remnants, by David H. Riskind, et al, in Prairie: A Multiple View, Proceedings of the Fourth Midwest Prairie Conference, University of North Dakota Press, 1975.

True Copy of Letter and Resolution of Commissioners' Court of Bell County, Texas

January 5, 1984

EXHIBIT K

Mr. W. A. Hale, Vice President
ETSI Pipeline Project
P. O. Box 7563
Tulsa, Oklahoma 74105-0563

Re: ETSI Coal Slurry Pipeline across Bell County, Texas

Dear Mr. Hale:

It would be a great benefit to Bell County, and hence an accommodation to us, if you could have your pipeline miss a small, very rare natural area (18.04 acres) which is now in its path.

To that end, the Commissioners Court has unanimously passed the enclosed resolution.

The background of the matter is this:

At one time east Bell County was a vast natural prairie, a part of one of the world's greatest grasslands. The rich prairie sod and black soil has long since been plowed up and put into cultivation, and the native vegetation largely lost, on practically one hundred percent of our county's Blackland Prairies.

Several years ago, our area's premier naturalist, Bob Burleson (former member of the Texas Parks and Wildlife Commission), discovered this 18.04 acres of Blackland Prairie which had never been plowed or disturbed. He bought it, paying far more than the market for surrounding farmland, in order to preserve it intact. He makes it freely open and available for study groups, schools, scientists, government workers in agriculture, or other persons with interests in such matters. It is a designated Bell County Natural Area and posted as such.

So far as I know, it is the only such area left intact in our county that is assured of proper management and preservation.

As you probably know, our county is the center of state and federal farm organizations, including the U.S. government's national Grassland Soil and Water Research Laboratory, and people here take an intense and informed interest in such matters.

Thus, we request that you rearrange your route so as to miss this small natural area. It would not only be a benefit to the county, but we believe it would benefit you as well, since the circumstances would make it an unpopular piece of property for you to cross.

Thank you for your assistance in this.

Sincerely,

John Garth
County Judge
Bell County, Texas.

True copy of original

LETTER 38 (CONTINUED)

STATE OF TEXAS §
COUNTY OF BELL §

A RESOLUTION OF THE COMMISSIONERS COURT OF BELL COUNTY, TEXAS, REGARDING EXCLUSION OF A BELL COUNTY NATURAL AREA AND HISTORIC SITE FROM THE RIGHT-OF-WAY OF THE ETSI PIPELINE PROJECT

The Commissioners Court of Bell County, Texas, at a regularly scheduled meeting thereof, has considered the materials furnished the County by the Joint Venture known as the ETSI PIPELINE PROJECT. It appears that the proposed right-of-way through Bell County is likely to cross a tract of 18.04 acres in two tracts known as the MARUNA MEADOW PRAIRIE PRESERVE, the exact location of which is shown on Exhibits A and B attached hereto and made a part hereof. The MARUNA MEADOW PRAIRIE PRESERVE is one of the very few remaining remnants of the Blackland Prairie, the pioneer vegetation of Bell County, and is a particularly important one because it is in good natural condition and has never been subject to the plow or abusive grazing. It is a BELL COUNTY NATURAL AREA, and has been posted as such for nearly four years, long before there was any hint of a coal pipeline crossing it. It has both historical and scientific value, and although it is privately owned, its preservation is assured for the future by substantial guarantees and a large investment of private funds for its acquisition and preservation. The tract is small, at this early stage of the pipeline project, the cost of missing this small prairie tract is insignificant and the crossing of the small tract by a large pipeline and associated heavy construction equipment would do permanent damage to a valuable historic and scientific resource of the County and its citizens. THEREFORE, upon motion duly made, seconded, passed and adopted it is RESOLVED by the Commissioners Court of Bell County, Texas, that this body do go on record as opposing the inclusion of any part of the MARUNA MEADOW PRAIRIE PRESERVE, as described on Exhibits A and B hereto, within any part of the right-of-way of the ETSI PIPELINE PROJECT through Bell County, Texas, because same is a BELL COUNTY NATURAL AREA and a valuable historic and scientific site that is actively used for educational and scientific purposes and for inspiration and enjoyment by many citizens of the County. A certified copy of this Resolution shall be furnished to the Railroad Commission of Texas and to the managers of the pipeline project.

DONE this the _____ day of December, 1983.

_____
COUNTY JUDGE, BELL COUNTY

ATTEST:

_____
Deputy County Clerk and
Secretary to the Commissioners
Court of Bell County

BAYLOR UNIVERSITY
DEPARTMENT OF BIOLOGY
Waco, Texas 76703

EXHIBIT L

May 29, 1980

The Nature Conservancy
Texas Field Office
201 N. St. Mary's
San Antonio, Texas 78205

Sirs:

Several recent events indicate the critical nature of remaining blackland (tallgrass) prairie in Texas. For example, a new report by J. Klopatek et al. (Environmental Conservation, Autumn 1979) lists this distinctive natural community as the 16th most endangered type in North America with bluestem prairie in general as the 3rd most endangered (blackland is a geographic variant of tallgrass, a kind of bluestem prairie). Also, the VH prairie, the largest and best studied in McLennan and adjoining counties is now for sale in an industrial park development. At about 20 acres it is small but still larger than most remnants which are 10 acres or less. Remaining blackland prairies are simply hay meadows. As family farms disappear, so too do the hay meadows, because more money is made by selling the farmland for development than for farming.

Although good arguments are made for preserving a few large natural landscapes, rather than many, small ones, this just is not possible in the blackland prairie region. As the map in Klopatek et al. shows, this central Texas area retains the smallest percentage of natural landscape of any in the state and is matched in this regard by the prairie regions of the Midwest. There are no possibilities for large preserves! Therefore, a series of small preserves is dictated, and these should (1) represent all parts of the area and all dominance-types, (2) be the largest and best-studied available, and (3) be purchased with the greatest amount of bordering farmland (buffer Zone) that can become restored or regenerated blackland prairie, so that larger preserves will be generated for the future.

Sincerely,

F. R. Gehlbach
Associate Professor

Encl. Klopatek and Gehlbach articles (see methodology and VA prairie rating in the latter).

ESPEY, HUSTON & ASSOCIATES, INC.
Engineering & Environmental Consultants
7616 L.B.J. FREEWAY • SUITE 425
DALLAS, TEXAS 75251
(214) 387-9729

May 29, 1980

The Texas Chapter of
The Nature Conservancy, Inc.

It has come to my attention that funds are potentially available for establishment of prairie preserves in Texas. Based on extensive Texas experience, the greatest need for such preserves exists in the Blackland Prairie and its outlier components (such as the Fayette Prairie).

As discussed in previously published technical articles, I believe the Blackland Prairie climax remnants are being destroyed at a rapid rate by accelerated urbanization and increasing crop prices. These factors have acted to preclude, in many instances, family-owned dairy and/or farm operations. As these land use entities disappear so does the need for hay meadows (climax remnants) to support a few cattle during the winter.

The Blackland Prairie represents the largest extent of vertic soils in the world. These are unusual because of high montmorillonitic clay content and resulting shrink-swell characteristics.

The east-west edaphic variation and north-south climatic variation result in several identifiable habitat-types. It is critical to preserve representation remnants of each type. For example, Tridens Prairie, in the northeastern portion of the Blacklands is unlike the average Black Prairie remnant in any other portion of the Prairie.

Again, I feel strongly that a preservation effort of some magnitude is critical. With continuing sunbelt development and growth of cities such as Sherman, Plano, Dallas, Ennis, Corsicana, Waco, Temple, Austin, San Marcos and San Antonio, tomorrow will be too late.

If I may be of future service, please call.

Very truly yours,

O. Brown Collins
Associate Ecologist

EXHIBIT M

LETTER 39

The City Of
San Angelo, Texas
P. O. Box 1751 - Zip 76902 Phone 915-657-4241

March 11, 1987

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

39-1 In the Draft Supplemental Environmental Impact Statement for the All American Pipeline Project (northern route), automatic pressure sensing shut-off valves have been placed on every major live stream, except one, that are tributaries to San Angelo water supply lakes. That one exception is Pecan Creek.

The automatic control valves are located on Spring Creek, Dove Creek, and South Concho, which all feed Twin Buttes Reservoir. Pecan Creek is the sole tributary to Lake Nasworthy. Lake Nasworthy is a controlled level lake maintained by springs at the head waters of Pecan Creek and by controlled releases from Twin Buttes Reservoir.

Pecan Creek is totally unobstructed and free from any channel dams from its head waters to where it empties into Lake Nasworthy. Should a spill occur adjacent to Pecan Creek, the contamination risk could be far greater on Pecan Creek because any pollutants would be allowed to flow unobstructed and quickly into Lake Nasworthy.

It is inconsistent to place automatic shut-off valves on the other live streams feeding San Angelo's lakes and neglect Pecan Creek. The City of San Angelo cannot endorse the All American Pipeline Project without similar safety devices on Pecan Creek as has been proposed for the other live streams.

Sincerely,

Richard Crisp

Richard Crisp
Councilmember, S.M.D. #5

RC/gsf

MAYOR : Burt Terrill CITY MANAGER : Stephen Brown
CITY COUNCIL :
Gary Shrum : Don Butts : Daniel Cardenas : Carline Tucker Richard Crisp : Tim Edwards

RESPONSE TO LETTER 39

39-1 Mitigation Measure SS-2 specifies a remote-control block valve at the South Concho River. We find no reference to remote-control valves at Spring Creek and Dove Creek, as referenced by the comment. The South Concho River is a major river crossing with sensitive downstream resources (refer to Mitigation Measure SS-2 in Appendix A), and as such requires a remote-control valve.

Pecan Creek, Dove Creek, and Spring Creek were not identified as major crossings since significant impacts to sensitive resources are not anticipated.

As such, they do not have the protection mandated by Mitigation Measure SS-2. The Northern Alternative crosses Pecan Creek 8 miles upstream of Lake Nasworthy. At the crossing, Pecan Creek is intermittent. The Northern Alternative crosses Dove Creek in southeast Irion County 17 miles upstream of Twin Buttes Reservoir. At the crossing, Dove Creek is a small, intermittent stream. Downstream of the crossing is Dove Creek Spring which contributes a large flow to Dove Creek. Dove Creek is perennial downstream of the spring. The Northern Alternative crosses Spring Creek 28 miles upstream of Twin Buttes Reservoir. Spring Creek is intermittent at the pipeline crossing.

LETTER 40

CITY OF CAMERON
TEXAS 76520
P.O. Box 833 • Phone (817) 697-6646

MILTON J. SCHILLER—Mayor

City Council
BESS JETER—Ward 1
JAMES E. LAFFERTY—Ward 2
LARRY PATTERSON—Ward 3
BETTY KOPRIVA—Ward 4
JULIUS A. WHITESIDE—Ward 5
WILLIAM E. KELM—At Large

LANNY C. FRENCH
City Secretary
City Coordinator

JANET SHEGUIT, R.T.A.
Asst. City Secretary
Tax Assessor-Collector

CHARLES C. SMITH
City Attorney

TESTIMONY OF MILTON J. SCHILLER, MAYOR OF CAMERON, TEXAS BEFORE THE PUBLIC HEARING BY THE U. S. BUREAU OF LAND MANAGEMENT MEETING, WACO, TEXAS, MARCH 12, 1987

At a stated meeting of the Cameron City Council on March 2, 1987, our agenda had an item concerning the Northern Route of the All American Pipeline through Milam County.

40-1 The Governing Body of the City of Cameron is extremely concerned about the possibility of a spill that would affect the City Municipal water supply , which is Little River. This is the only water supply for a city of some 6,000 residents. It has been the only water supply since this City was established in 1846.

40-2 The other concern of the City of Cameron is that the City owns 107 acres of land 5 miles West of the City where it is developing a sanitary landfill. It appears the proposed Northern Alternate Route of this pipeline will pass through this land, which under State requirements for sealing in the landfill, would appreciably add to the cost to this City for development. This additional cost, of course, would be an expense we would have to pass on to our citizens and feel it should not be a cost they should have to bear.

We respectfully request these two concerns of the City of Cameron be honored in the Environmental Impact Statement prepared by the Bureau. from this hearing.

RESPONSE TO LETTER 40

40-1 The Little River has been identified as a major crossing; as such, it will receive additional engineering design; please refer to page 2-27 of the Draft SEIS. Mitigation Measure SS-2 in Appendix A indicates a remote-control block valve is proposed for the Little River crossing. This valve will reduce the volume of any spill. The final Oil Spill Contingency Plan will detail cleanup procedures for the Little River. Please refer to the Modifications and Corrections section for page B-53 and Table B4-1a.

40-2 The pipeline project is not compatible with the sanitary landfill. The landfill over the pipeline would make it impossible to service the pipeline or to detect oil spills at or near the surface. AAPL has stated it will work with the City to identify the property ownership in question and reroute the pipeline in an area that does not conflict with the proposed future landfill development.

LETTER 41

Honorable Federal Administrative Law Judge:

We, Dennis and Monica Marek, oppose the proposed northern route of the Celeron-All American pipeline and the location of Pump Station #5 which would be on the Wilcox Aquifer. The northern route would pass through the two acres we own located 3½ miles west of Cameron on Hwy 36 and has a 21' well that we dug in May, 1986, a new house we built in August, 1986, and a mechanics shop we built in December, 1986. Our property is situated on the Wilcox Aquifer which extends one mile north of Hwy 36 and as far south as the Little River.

41-1 We and our neighbors rely on our wells for water and it all comes from the Wilcox Aquifer. We know from tests throughout the years that the water from this aquifer is excellent drinking water. We also know that the Wilcox Aquifer is a reliable source of water because people have been drinking water from it since the horse and buggy days when stagecoaches passing on the old Belton-Cameron road would stop at the "Jess Devers Well" located on what is now the Titsworth Farms. Also, when digging a well in August, 1964, the Titsworths hit water at 12' and when the well was finished it produced 1,000 gallons of water per hour, and that was during a drought when we were 8" below norman rainfall.

I understand that enginers claim the chances of this proposed pipeline ever leaking are slim, but it can happen! I have found out that when a leak does occur it is usually at the pump stations. If an oil leak should occur in our area the Wilcox Aquifer would

41-2 be destroyed. We do not like the idea of anyone endangering our most precious resource-WATER. What we are interested in is preserving a pure, natural source of water which has existed for hundreds of years. It is a consolation to me to know that if all the rivers became contaminated we could turn to the underground waters of our nation's aquifers for drinking water.

Please don't play games with our most precious resource. We can not survive without water, and all the "economic Values" of oil will not do us a bit of good if we do not have water to keep us alive to enjoy it.

Sincerely,

Dennis Marek

Dennis Marek

Monica Marek

RESPONSE TO LETTER 41

41-1 Thank you for commenting. Please refer to the response to Comment 30-1 regarding the vulnerability of the Carizzo-Wilcox Aquifer to an oil spill.

41-2 Your opposition to selection of the Northern Alternative based on possible pollution of the Wilcox Aquifer is noted; please refer to the response to Comment 30-1.

LETTER 42

Mar. 12, 1987

To: Honorable Federal Administrative Law Judge:
Name: Clem Tomek
Address: Rt. 1, Box 53
Cameron, Texas 76520
Birth date: November, 1, 1923
Age: 63
Occupation: Farmer, Rancher and working out.
Acres owned: 152

Location: 5 miles west of Cameron, Texas (on Wilcox Aquifer) wells for family drinking water and neighbors also.

We oppose the proposed northern route of the "All American Pipeline" and Pump Station #5.

42-1 Our human body needs good water daily for drinking, bathing and other use. God created the "Wilcox Aquifer" and it will last many more generations unless polluted by oil or landfills. The "Wilcox Aquifer" has many water wells that produce many gallons per hour.

RESPONSE TO LETTER 42

42-1 Your concern regarding the Wilcox Aquifer along the Northern Alternative has been noted; please refer to the response to Comment 30-1.

LETTER 42

2.

Our well produces plenty of good water every day for drinking, bathing and other use.
We want to conserve the Wilcox Aquifer for the future generation.
The heated oil pipeline would gradually get corroded and cause
42-2 an oil leak or an explosion some day and pollute the Wilcox Aquifer that produces our good water.
Our democracy guarantees us equal rights on all 3 proposed routes. We do not want the heated oil pipeline on the proposed northern route.

Sincerely,
Clem Tomsh

RESPONSE TO LETTER 42

42-2 Your opposition to selection of the Northern Alternative based on possible pollution of the Wilcox Aquifer is noted; please refer to the response to Comment 30-1.

LETTER 43

Honorable Federal Administrative Law Judge!

1. Mr. + Mrs Edwin F. Marck
Rt 1, Box 86, Cameron Tex 76520.

We are both in the 50's and have worked on farm land all our life.

We own 50 acers of land that well be adjouring where the pump Station "5" will be.

We are very much concern about the oil pipeline that well be comming through our 50 acers of land.

43-1 The only source of water we have it comes from a water well that is located on the "Wilcop aquifer".

All the neighbors also get their water from well. Where will we get our water from if the pipeland come through and cuts our water off or pollute it. The pump station #5. will

43-2 be close to my house I am sure you would not want to listen to it all the time so why would you like to hurt somebody else hearing.. We dont need the oil like we need

43-3 the water. We use lots more water than we do oil. We dont want that pipeline on our

RESPONSE TO LETTER 43

43-1 Your comment regarding the Wilcox Aquifer along the Northern Alternative has been noted; please refer to the response to Comment 30-1.

43-2 Please note that potential significant noise effects in the vicinity of your home have been identified in Section 4.3.15.2 of the Draft SEIS on page 4-140. Mitigation Measure N-1 in Section 4.7.15 of the Draft SEIS addresses the noise effects. Note also, however, that a location 4 miles west of Cameron would be approximately 0.5-mile from the Northern Alternative. Worst probable case noise levels, illustrated in Table G-1 in the Modifications and Corrections section, would be approximately 44 dBA at that distance, which would be approaching existing noise levels in the area.

43-3 Your comment regarding the importance of water for your livelihood and survival is noted; please refer to the response to Comment 30-1.

LETTER 43

43-3 Cont.

property. It will do more damage than good to us.

43-4

The Wilcox aquifer will be here for a long time if only people would not pollute it by oil or the landfills. We do not need the tapes money Some other routes might need that tax money. There are about 50 Families that depend on our water. our springs in our wells come in about 10 Feet from the top of the Ground and you will be digging deeper than that and cut off our water springs.

The Edwin F. Marsh Family
Rt 1 Box 86
Cameron Tex 76520

and another thing im concerned about is Pump station, next to my place. making to much noise.

RESPONSE TO LETTER 43

43-4 Your concern regarding potential pollution of the Wilcox Aquifer and your opposition to the Northern Alternative are noted. Please refer to the response to Comment 30-1.

LETTER 44

March 12, 1987

HAND DELIVERED

William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

My name is Tina Titsworth Strmiska, Rt. 1 Box 63, Cameron, Texas 76520, (817) 697-2787. I was born in Cameron, Texas in Milam County on May 31, 1957, and I have lived on the Wilcox Aquifer in Milam County all my life. I have attended college. I am married to Larry Strmiska and we have 2 sons, Eric 9 and Joseph 7.

Honorable Sir, guess what! Our farm and new home is in the path of the proposed "Northern Alternate Route" plus the proposed Pump Station #5 of the "All American Pipeline." We have almost completed our new "Austin Cut Stone" home on our peaceful and profitable farm 4 miles west of Cameron, Texas just off U.S. Highway 190 located on the Wilcox Aquifer. We are in the process of completing our family well for drinking water supply and water for other uses.

In 1965, at age 9, I helped start our profitable "Racing Greyhound Kennel". This is our chosen lifetime occupation, business, and profession. The racing greyhound business was and still is a close family business. This business helped provide for our educations. It is now our only source of income. The profits from this business has helped build our new home, dug our well, is educating our children, provides funds for projects, and supports our family.

44-1 Greyhounds are hyperactive dogs that cannot tolerate noises, or foul odors which would be produced by an oil pipeline, and pump station. On page 3-161 of draft EIS, the following language is set out, "no non-residential sensitive uses have been specifically identified on the Northern Alternative Route, although there may be research activities in progress on some farms and ranches that will have to be identified through contact with individual landowners." Our greyhound farm is a sensitive non-residential <u>use</u> and we <u>do</u> <u>conduct</u>

RESPONSE TO LETTER 44

44-1 Your concern regarding the potential noise disturbance to your greyhound breeding operation is noted. AAPL has indicated it will consider minor realignments to the selected route to avoid sensitive resources.

LETTER 44

Mr. William Haigh
March 12, 1987
Page 2

44-1 Cont. research on this property. To my knowledge no one has had the decency to do proper preliminary studies in our case; therefore, you can guess what mental considerations we and our neighbors expect to possibly happen in the present and future to our families, homes, farms, ranches, water and livelihood.

44-2 Our ability to make a living could be eliminated if noises, odors, or pollution from this pipeline begin to impact our farm. My husband and children are also self-employed at the farm. Surface pollution could eliminate our children's catfish production, livestock projects, and natural wildlife associated with our farm and neighboring farms.

44-3 Many of our neighbors depend entirely on water wells from the Wilcox Aquifer as their only source of family drinking water. Our bodies are over 70% water and needs replenishing daily, but our bodies need no crude oil for survival.

44-4 We object to the proposed "Northern Alternate Route One" of the "All American Oil Pipeline" and the proposed "Pump Station #5" and its pollution possibilities. This proposed route will cross the Wilcox Aquifer. Our constitutional rights and privileges are equally guaranteed to our families, farms, ranches, wildlife, and businesses as they are to the people and communities in the "Edward Aquifer " route, or any other route or aquifer, regardless of its size, use, population , or businesses.

44-5 The proposed pipeline, and "Pump Station #5" is proposed to be located over the Wilcox Aquifer near U.S. Highway 190. The pump station foundation will be in the underground water strata, and vibrations could cause soil cave-ins resulting in underground pollution and the cutting off of our drinking water supply. Prior to pipe installation through Northwest Milam County, a study must be made of the earth tremors (seismic events) that are periodically felt by many farmers and homeowners in this area.

44-6 The computer model used to evaluate the impact of noise levels on the environment is too simplistic a model to account for noise sensitivity levels for greyhounds and most wildlife. Specific wildlife information in Milam County is very inadequate as to EIS page E2-35 as we have many species not identified nor listed. The Wilcox Aquifer, rivers, and streams not only attract wildlife but families and businesses.

RESPONSE TO LETTER 44

44-2 Your concern regarding the potential loss of livelihood due to possible surface water pollution relating to your catfish pond and potential disturbance to your greyhound breeding operation is noted. We are unable to locate literature relating to noise levels which may cause disturbance to breeding greyhounds. AAPL ROW alignment personnel will consider minor realignments to minimize disturbance to sensitive resources. The likelihood of an oil spill along any particular 0.50 mile segment is very low. Based on previous oil spill statistics in Table 4-3 of the Draft SEIS and the project design, the most common cause of oil spills is attributed to damage by equipment. Therefore, private landowners can ensure the protection of the section of line through their property.

44-3 Your comment regarding the Wilcox Aquifer along the Northern Alternative is noted; please refer to the response to Comment 30-1.

44-4 Your comment regarding your objection to the Northern Alternative based on the location of pump/heater Station 5 and potential impacts to the Wilcox Aquifer is noted. Please refer to the response to Comment 30-1 regarding the potential oil spill risks for the Wilcox Aquifer. Because the Edwards Aquifer is a solution limestone formation, should an oil spill reach the aquifer it would be difficult if not impossible to remove the oil. The vulnerability of a sandstone aquifer, such as the Carrizo-Wilcox Aquifer, is much less and the feasibility of cleanup is much higher. Table 2-12 in Modifications and Corrections Section 3.2 and the impact summaries in Modifications and Corrections Section 3.4 evaluate impacts, their likelihood of occurrence, the significance of an oil spill should it occur, and the ability to mitigate potential impacts. Based on the impact analysis, which considers more issues than groundwater, the Northern Alternative is recommended over the other two routes.

44-5 Engineering evaluations indicate impacts would not be significant.

Refer to Mitigation Measures G-1 through G-3. The Wilcox Aquifer, being a sandstone formation, would be capable of sustaining normal areal yield even in the unlikely event of a discrete collapse at or immediately adjacent to pump station. Likewise, such a formation would provide a natural filtering medium for pollutants, which would essentially consist of dissolved and suspended solids, resulting from such a collapse.

As stated in the above-referenced Mitigation Measures, preliminary geologic reconnaissance will include quantification of seismic risks along the proposed route, and design specifications for pump stations and like structures will consider seismic effects, if present.

44-6 Your comment regarding this issue is noted. Impacts on wildlife from construction noise were evaluated and found to be temporary and transient. In cases where the impact could be significant, mitigation was recommended such as timing constraints for construction during reproductive periods; see Mitigation Measures TB-8, TB-10, and TB-11. We are unaware of any documentation in the literature of noise studies specific to greyhounds.

LETTER 44

Mr. William Haigh
March 12, 1987
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Cameron, Texas is readily expanding west on U.S. Highway 190 where families of the future are seeking good drinking water from our Wilcox Aquifer. They are also looking for the peaceful country living and the beauty of our wildlife, vegetation, trees and native flowers in which to rear their children. Recently a new church and school has been started. The proposed pipeline and pump station #5 will definitely challenge this expansion of future families, their health, and business progress.

44-7 Documentation in the EIS Supplemental page A-5---2.2 Spill Frequency Calculations northern route has the most miles of pipeline, the most spills per year possibility and most spills in 40 years possibility. Pp. A-5 summary- "Therefore, these measures provide an additional 44% reduction in overall spill risk at the Edwards Aquifer." Why is this more important than any other Aquifer? Page A-9 - 2.5 The northern route shows more spills, fatalities, and more injuries than other routes. Why should we be the least of the 3 proposed routes? Page A-11-2.6 Property damage---again the proposed Northern Route excel in total damage---on-and on.

44-8 We would like to cooperate with the proposed Northern Route of the "All American Pipeline" and the "Proposed Pump Station #5", but we do not want your oil line, we do not want your pump station #5, we do not want your pollution, and most of all we do not accept your inadequate studies or methods; therefore, we prefer no route at all.

Sincerely,

Tina C. Strmiska

Tina Strmiska

RESPONSE TO LETTER 44

44-7 Please refer to the response to Comment 44-4.

44-8 Your comment regarding your support for the No Project Alternative is noted. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172.

LETTER 45

March 12, 1987

HAND DELIVERED

William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

My name is Cornelius (Bo) Titsworth, Route 1, Box 62 Cameron, Texas 76520, (817) 697-4111. I was born at Thorndale, Texas, on February 23, 1927, and have lived all my life in Milam County except for seven years of navy and college training. I have a Masters Degree in Vocational Agriculture Education from Texas A&M and have taught 28 years in the Buckholts and Cameron Public Schools. I have worked with farmers in all these communities concerning livestock, crops, soils, and water resources. I taught Civil Defense classes which included acquiring underground water data and well locations that could be used in the event of surface water contamination. I have been very active with Milam County governmental agencies as well as school, church, and community affairs, for all my life. Since 1953, we have lived on our peaceful and profitable farm 4 miles west of Cameron, Texas, located on the Wilcox Aquifer.

45-1 We have 3 children and 4 grandchildren living on our farm and our entire financial support is earned on this property. We purchased our farm because of the excellent quality drinking water found here. Our 16-foot water well produces 1,000 gallons of water per hour, and another well on this property produces over 500 gallons of water per hour. The historic "Jess Devers Well" was located on our farm and it was a horse and buggy stop on the "Old Cameron-Belton Highway" years ago. Our neighbors depend entirely on their well water for drinking, and have no other available source of drinking water. Some of our neighbors have paralyzed children, some have bed-ridden parents, and many are retired people, and shift workers employed at Alcoa, TUGCO, and other industries that require various 24-hour rest periods. Noise, odor, and groundwater pollution from an oil pipeline should not be allowed to interfere with our way of life.

RESPONSE TO LETTER 45

45-1 Your comment regarding the Wilcox Aquifer along the Northern Alternative is noted; please refer to the response to Comment 30-1.

LETTER 45

Mr. William Haigh
March 12, 1987
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45-2 In 1965, our 3 children started our "Racing Greyhound Kennel" that supports our livelihood. Greyhounds are hyperactive dogs that cannot tolerate noises, or foul odors which would be produced by an oil pipeline. On page 3-161 of the draft EIS, the following language is set out, "no non-residential sensitive uses have been specifically identified on the Northern Alternative, although there may be research activities in progress on some farms and ranches that will have to be identified through contact with individual land owners.". Our greyhound farm is a sensitive non-residential use and we do conduct research on this property. Our ability to make a living could be eliminated if noises and odors from this pipeline begin to impact our farm.

45-3 We object to the proposed "Northern Alternate Route One" of the "All American Oil Pipeline" and the proposed "Pump Station #5" and its pollution possibilities. This proposed route will cross the Wilcox Aquifer. Our constitutional rights and privileges are equally guaranteed to our families, farms, ranches, wildlife, and businesses as they are to the people and communities in the "Edwards Aquifer" route, or any other aquifer, regardless of its size or population or businesses.

45-4 The proposed pipeline and its Pump Station #5 will be located over the Wilcox Aquifer near U.S. Highway 190. The pump station foundation will be in the underground water strata, and vibrations could cause soil cave-ins resulting in groundwater pollution and the cutting off of our drinking water supply.

45-5 No evaluation has been made of the positive economic effect that will occur on the Texas economy if the under-utilized and shut-down refining capacity of the Permian Basin and Panhandle areas was used to refine this crude oil. There should be available refining capacity in the Permian Basin and Panhandle areas of Texas to refine this crude oil and thus eliminate the need to refine it on the Gulf Coast.

45-6 The air quality impacts of the pipeline project have not been adequately evaluated in the EIS. There are eleven volatile organic compound non-attainment counties in Texas. The majority of these counties are located on the Texas Gulf Coast. The air quality in these counties,(Brazoria, Galveston, Harris, Jefferson,Nueces, Orange, and Victoria), does not need to be polluted further by refining the high sulfur crude oil that will be transported in the pipeline.

RESPONSE TO LETTER 45

45-2 Please refer to the response to Comment 44-1.

45-3 Please refer to the response to Comment 44-4.

45-4 Please refer to the response to Comment 44-5.

45-5 The heavy crude proposed for shipment by AAPL requires a heavy crude oil refining capability that is available at the Gulf Coast refineries. The Permian Basin refineries of the Texas panhandle area do not have sufficient capacity at present for this heavy crude.

45-6 Thank you for your comment regarding potential indirect air quality impacts of the proposed pipeline. Please refer to the response to Comments 56-9 and 99-8 and Section 4.2.10.3.2 of the Draft SEIS.

LETTER 45

Mr. William Haigh
March 12, 1987
Page 3

45-6 Cont. There is no evaluation in this report of the environmental effects of increased SO_x emissions on the Gulf Coast area. Gulf Coast refining activities are major contributors to SO_x emissions which has resulted in documented SO_x problems in this area. The influx of large volumes of high sufur crude will increase SO_x levels in these Gulf Coast refinery areas. This will affect area worker productivity and efficiency. It also discourages the location of clean industries (such as Research & Development) to the area. Sulfur oxides combine with humidity in the air to form sulfuric and sulfurous acid capable of irritating the delicate mucous membranes of eyes, nose, throat, and lungs. Medical reports have previously documented increased respiratory illness when SO_x levels rise. This results in increased medical costs and lost work days. This report has not taken these economic and sociologic effects into account. The report simply reviews the tax benefits and transient salary influx from pipeline construction. The damage done from acid rain that will result from the increased level of SO_x also has not been evaluated in this report.

45-7 Prior to laying a pipeline of this size, through Northwest Milam County, a study must be made of the earth tremors (seismic events) that are periodically felt by many farmers and homeowners in this area.

45-8 The computer model used to evaluate the impact of noise levels on the environment is too simplistic a model. This model does not take into account noise sensitive areas such as my "Racing Greyhound Kennel." Wildlife in the area such as deer also are noise sensitive and the impact on these animals also has not been accurately and thoroughly considered.

45-9 The No Action Alternative has hardly been explored. Less than 10 pages in this 2" thick document have been used to explore this alternative. The major reason for this seems to be that Pactex is proposing a 900,000 BPD crude oil pipeline from Los Angeles to Midland and this pipeline would be a direct competitor with All American for oil transportation if the No Action Alternative were selected (See Page 2-41 of Draft EIS).

45-10 Pactex will utilize inplace pipelines from West Texas to the Gulf Coast. It appears that the All American Pipeline Co. project would duplicate the project proposed by Pactex.

We believe that existing pipelines could be utilized by All American Pipeline Co., if crude oil must be shipped to the Gulf Coast. The current volume of crude oil carried by the

RESPONSE TO LETTER 45

45-7 The faults associated with the Northern Alternative are discussed on pages 3-126 and 3-127 of the Draft SEIS. As indicated on page 4-45 of the Draft SEIS, seismic impacts to the pipeline are not expected.

45-8 Your comment concerning noise levels is noted. We are unaware of any documentation in the literature of noise studies specific to greyhounds. Noise levels generated by the pump station are not expected to significantly impact wildlife.

45-9 Your comment regarding the No Project Alternative is noted. Please see Modifications and Corrections section for pages 2-37 and 4-172.

45-10 The primary objective of the Pactex Crude Oil Pipeline is to transport Alaskan North Slope crude from the West Coast to the refineries in the Gulf Coast region. The primary goal of the All American Pipeline is to transport heavy crude from California to the Gulf Coast region. It is possible for either pipeline to ship the crude oil slated for the other. However, it would be more difficult for Pactex since the heavy California crude requires heating, or diluting with a lighter grade oil such as the Alaskan North Slope crude. Most shippers attempt to keep the higher grade oils separated from the lower grade heavy California crude, and it would not be economically desirable to mix the two.

LETTER 45

45-10 Cont. existing pipelines (from West Texas to the Gulf Coast), versus their capacity, is not known (Draft EIS Page 2-39). This is a critical piece of information which should have been determined in the economic justification of this pipeline. There may very well be enough unused pipeline capacity to transport this crude oil to the Gulf Coast but this study fails to provide this necessary information.

45-11 We think the people of this area are trying to give someone a "polite message." That message is the economic, environmental and sociologic impacts of placing a pipeline through this area have not been adequately studied. If they are studied, the No Action Alternative would be seriously considered by the Bureau of Land Management and All American Pipeline Co.

45-12 The cumulative environmental impacts of this pipeline facility have not been addressed.

I appreciate your time and the opportunity to address some of the critical issues that are involved in this decision. We are not blindly opposed to progress, but we are opposed to blind progress.

Sincerely,

Cornelius Titsworth

Cornelius (Bo) Titsworth

03/225

1

1 See attached newspaper article #1 from the U.S. Soil Conservation Service, "Caving Soils Threaten Area People, Property."

This territory is part of an area where the soils of the "Black Land Belt of Texas" starts joining the "East Texas Sandy Soils" north of Little River, resulting in 12 or more kinds of soil.

Refer to the attached news article #2, "Officials Voice Concern About Oil Pipeline Plan."

Refer to the attached news article #3, "Pipeline Route Draws Comment."

RESPONSE TO LETTER 45

As discussed in the No Project Alternative in the Modifications and Corrections section for page 4-172, there are approximately 12 pipelines that could be used to transport crude oil from West Texas to the Gulf Coast area refineries and refineries in Oklahoma. The overall capabilities of these lines is proprietary, and no regulatory agency maintains records on throughput. Based on recent discussions with TRRC (Sanchez 1987), data on throughput for these lines are unavailable. We estimate that it would require 15 to 20 percent of the total capacity of those existing pipelines to transport 300,000 BPD of crude oil based on values in Table 2-13 in Section 3.2 of Modifications and Corrections. It is unlikely that this large volume of capacity is available, and the lines are not capable of transporting heated crude oil. It would be technically possible to dilute the heavy crude oil with the lighter West Texas oil, thus allowing it to flow through these systems; however, most shippers do not wish to mix lower grade oils with higher grade oils.

45-11 Your support for the No Project Alternative is noted.

45-12 Please refer to the response to Comment 56-140 for a discussion of cumulative impacts.

Mr. William Haigh
March 12, 1987
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Refer to the attached news article #4, "N W Milam On List for Groundwater Study."

Temple Daily Telegram, Temple, Texas

Saturday, February 21, 1987

Caving Soils Threaten Area People, Property

Soil cave-ins threaten lives and homes, particularly for most of Central Texas, a U.S. Soil Conservation Service study shows.

Land surveys show that Texas, more than any other state, has the greatest potential for cave-ins due to the shrinking and swelling of soil — usually clay.

The shrink-swell effect has caused deaths and damage to constructions with poor foundations. "Working on clay can be deceptive because it looks firm," Dale Allen, SCS information specialist, said. "Clay looks thick. It can fool you."

Some construction workers and contractors fail to take precautions to prevent slides because the soil look safe, he said.

Cave-ins have killed 50 construction workers in Texas during the past five years. Most deaths have occurred in trenches dug for plumbing and electrical lines, he said.

A fact sheet distributed by the Soil Conservation Service in Temple explains that clay has a tendency to shrink and crack when dry and swell when wet. This shrinkage and swelling causes slick areas to develop beneath the surface.

When a ditch is dug through such an area, especially when moist, the soil slips, he said. "Any little thing can trigger a slide."

Homes built on clay will eventually lean or crack if there's not on a good foundation, he said. Before buying a building or home, a person should have the subsoil checked and ask the contractor what precautions were taken to prevent the structure from leaning, Allen suggested.

Excavations in soils deeper than five feet with a vertical wall should be sloped, shored, braced or otherwise supported, Allen said.

"It bothers me that we have a room full of soil surveys and that more contractors aren't asking for them," Allen said.

A copy of the soil survey and fact sheet may be obtained at the SCS office, 101 S. Main St., Temple, Tex., 76501-7682.

Temple Daily Telegram, Temple, Texas

Tuesday, January 27, 1987

Officials Voice Concern About Oil Pipeline Plan

By DEBBIE WILLIS

Area officials expressed concern Monday about the final section of the All American oil pipeline cutting through Coryell, Bell, McLennan and Milam counties.

Temple Mayor John Sammons said he was concerned about environmental effects such as how an oil leak would affect wildlife by contaminating rivers and creeks.

"I see no long-term benefits," he said. "The short-term benefits would be that it would create a few jobs while it was being built."

The Celeron Corp., the oil and gas subsidiary of Goodyear Tire & Rubber Co., is building the 1,247-mile pipeline to pump crude oil from California to the Gulf Coast.

The Bureau of Land Management selected a preferred route for a Texas extension that would take the 30-inch underground pipeline from McCamey to McGregor, then on to Webster, which is near the coast.

The preferred route would enter the southern corner of Hamilton County, cut through the northern half of Coryell County, go south into McLennan County, move along the western side of the Falls-Bell county line and then cut through Milam County before going on to Webster.

Two alternate routes were suggested by the bureau after hearing opposition to the original route. That route would have crossed the Edwards Aquifer, a major source of drinking water south of Austin.

Bell County Judge John Garth said he wasn't pleased with the pipeline cutting through this area, but this route was preferable to the plan that crossed the aquifer.

"If it's got to be done, I'd much prefer that it come through this area. My initial reaction is I don't particularly like the route that was chosen, but it would be going through extremely hazardous areas with the aquifer. It could completely ruin water supplies."

Garth received an impact analysis from the Bureau of Land Management that he said he will study to understand benefits and hazards.

Although the bureats preferred route, the final decision will not be made until mid-July, said Phil Collins, environmental coordinator at the Bureau of Land Management.

Collins said public hearings will be scheduled in this area to consider area concerns and determine what problems might occur. He expects thammons said he was more concerned with future problems.

"What happens decades from now when the pipeline starts to deteriorate?" he said. "Fifty years from now are they going to be around to clean it up?"

Viewed With Mixed Emotions..Cameron, Texas, Herald, Jan. 29, 1987,

Pipeline Route Draws Comment

The proposed routing of a section of a 30-inch underground oil pipeline through Milam County on its way to the Gulf Coast is arousing some mixed emotions among officials and landowners in this and neighboring counties.

The original route proposed by Celeron Corp., the oil and gas subsidiary of Goodyear Tire & Rubber, would have crossed the Edwards Aquifer. Two alternate routes were proposed after opposition to the original.

The northern alternate would run from McCamey, where the line enters Texas, to the Central Texas area, cutting almost directly through the middle of Milam County from the northwest to the southeast lines.

The Bureau of Land Management has given preliminary approval to the northern route According to Texas Attorney General Jim Mattox, further construction of the pipeline was prohibited in May, 1986, pending the outcome of a "Supplemental Environmental Impact Statement" by the Department of the Interior.

FIVE-POUNDER

That statement was recently released, and a copy is in Milam County Judge Gene Blake's office. The statement volume, accompanied by a separate appendice, is about two inches thick and weighs at least five pounds. The appendice is about an inch thick.

The statement is a welter of type, maps, tables, graphs, drawings, and all the abundance of technical language common in government reports.

Judge Blake said he has not been contacted by "anyone" about the proposal, that he had just received the report which is in his office if anyone wants to look at it.

Blake said he has "mixed emotions" about the proposed pipeline route through the county. "If it were in the middle of my farm I'd certainly have reservations. But easements would be paid for, the landowners would retain certain surface rights, and any damages would be paid for."

He said the pipeline would add from $14 to $20 million to the county tax base, with funds usable for schools. "I'd like to see anything that would provide benefits for school children."

Blake said, "A few would be inconvenienced but the majority (of landowners) would not be disturbed."

'VITAL TO SECURITY'

The judge views the oil pipeline as being vital to security

See Pipeline, Page 6

Proposed Pump Station

Page 2, Cameron, Texas, Herald, Jan. 18, 1987

NW Milam On List For Groundwater Study

A small section of northwest Milam County is included in one of ten areas in the state proposed for detailed study as possible critical ground water areas, the Texas Water Commission said in a Jan. 13 news release.

That part of Milam County includes the Davilla and Val Verde areas and is part of the largest section of the state proposed for detailed study by the Texas Water Commission and the Texas Water Development Board.

According to House Bill 2 passed by the 69th Legislature in 1985, a critical area is one that is experiencing serious ground water problems or is expected to during the next 20 years.

These include shortages of surface or underground water, land subsidence due to underground water pumping and contamination of underground water supplies.

The area touching Milam County stretches from the Red River north, down to Bandera and Medina counties in south Texas. Neighboring counties affected include all of Williamson and Bell, and about half of Falls County.

After a detailed study is completed, a report will be prepared that includes the recommendations of both agencies and the advisory committee for the area.

A public hearing will then be conducted before a final decision is made on designation of the area by the Texas Water Commission as a critical ground water area.

If an area is designated critical, a process will be started to determine if creation of an underground water conservation district is appropriate to address the problems of the area.

Areas proposed for detailed study by TWC/TWDB

LETTER 46

COMMENTS on the SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT ALL AMERICAN PIPELINE PROPOSED EXTENSION McCamey, Texas to Webster, Texas

March 13, 1987
Brenham, Texas

by
Jack V. Matson
Associate Professor of Environmental Engineering
University of Houston
Houston, Texas 77004

I am representing Travis County, Hayes County, Gillespie County and the City of New Braunfels. First, I congratulate you on a comprehensive, study produced in a very short period of time. It serves us all well and says a lot for the process.

46-1 Furthermore, I agree with your preference for the northern route over the other three alternatives.

I will next discuss the report findings on the issues I raised on August 22, 1986 at the Scoping Hearing in League City, Texas.

46-2 My first area of concern was the possible contamination of the Edwards Aquifer from an oil spill. Benzene, the most toxic component of crude oil, was never directly addressed. Your so called worst case scenario, rupture by sabotage followed by rain in the Onion Creek watershed results in only 77 barrels introduced into the Aquifer (DSEIS, C-4, 6). Only 0.08 mg/l of dissolved hydrocarbon in the Aquifer

RESPONSE TO LETTER 46

46-1 Your comment regarding support for the Northern Alternative is noted.

46-2 Your comments regarding trace components in crude and the Onion Creek oil spill scenario are noted. The properties and behavior of crude oil are discussed in the revisions to Appendix A in Modifications and Corrections Section 3.3 of the Final SEIS. A revised Onion Creek to Edwards Aquifer oil spill scenario is included in Appendix B of the Final SEIS.

LETTER 46

results.

No explanation as to why this scenario is the worst case was made. That scenario is more representative of an act of vandalism than sabotage. Certainly worse "worst case" scenarios can easily be hypothesized. Terrorists may prevent clean-up crews from entering a spill site. Or they may blow up more than one section with multiple blasts. Orders of magnitude more oil could escape than is predicted. 46-2 Cont.

These low probability scenarios are potentially high impact and should be considered in the analysis. Understating the seriousness of such events can lead to wrong conclusions. And to pick a worst case scenario that shows minimal impact is misleading. The main reason for not selecting the preferred route is that such unpleasant events could happen at great risk to the viability of the aquifer.

Also misleading is a statement on p. 4-28 that "since the crude oil to be shipped... is 3 to 3000 times more viscous than water, rate of oil movement through soils and aquifers would be proportionately slower than that of water." 46-3

In the Karst foundations of the Edwards Aquifer recharge zone the movement may not be governed by one phase oil flow, rather two phase flow - which the oil breaks up into gobules and entrained by the water into the underground caverns and crevices where it is impossible to reclaim.

RESPONSE TO LETTER 46

46-3 Based on your comment, text changes to page 4-28 in the Draft SEIS are included in the Modifications and Corrections section of the Final SEIS for page 4-28. Also, please refer to Modifications and Corrections Section 3.3 of the Final SEIS for revisions to Appendix A concerning the behavior of crude oil.

LETTER 46

Since the DESIS understates the worst case scenarios - extrapolations based on past data, it does not address the long term impacts of major spills on water supplies other than to note that some wells within an area of the containment plume could be adversely affected (C-6) when in actuality the aquifer could be at great risk with the long term poisoning of wells and springs.

46-4 The issue of degredation products from oil in the aquifer is ignored along with the long term consequences.

This minimization of the worst case scenario is then further confused by the statement in the conclusion, that "an oil spill along the proposed route can still pose a significant risk to the Edwards Aquifer, despite an intensive mitigation program." (S-5) I totally agree with that statement. However the report does not show that "significant risk."

If it did, the earlier statement in the conclusion, "no one alternative is clearly superior to any other" would not be valid. The proposed route would be clearly undesirable compared to the alternatives.

46-5 The second major issue concerning the refining of high sulfur crude oil in the Gulf Coast area was minimally addressed in the report. In section 4.210.3.2, p. 4-84 to 4-89, no increase in acid rain is

RESPONSE TO LETTER 46

46-4 The Onion Creek to Edwards Aquifer Oil Spill Scenario has been revised; please refer to Appendix B of the Final SEIS.

46-5 Thank you for your comment regarding potential indirect air quality impacts of the proposed pipeline. Please refer to the response to Comments 56-9 and 99-8 and Section 4.2.10.3.2 of the Draft SEIS.

46-5 Cont.

expected from the refining of high sulphur crude, but the effects on ozone levels from a 6.1% increase in SO_2 emissions and a 3.0% increase in NO_x emissions is not addressed. The nonattainment status for ozone in Harris, Brazoria, and Galveston Counties makes this an important issue. The DSEIS does not address the possible increase in particulates or heavy metals associated with particulates from the stack emissions. Table 3-30, p. 3-99 shows California OCS has a concentration of 718 for metals. This is much higher than the other values shown and is of concern. These secondary impacts are important to the millions of people affected by the already poor air quality in the region. It seems to be taken as a "given" that the crude oil will get to the Gulf Coast and that California will have successfully exported their problem to us.

The third and fourth issues, those of impacts on the environment during construction of the pipeline and leak sensing technology have been addressed in the report.

In conclusion, in my expert opinion, the report offers the correct route recommendation for reasons that are shown in the report to be weak but in fact are strong.

AWARE

consultants in environmental management

PUBLIC STATEMENT OF JIM V. ROUSE

My name is Jim V. Rouse. I currently reside at 2239 South Hoyt Court in Lakewood (Denver), Colorado, where I serve as the Director of the Hydrogeology Group for the Denver and Nashville, Tennessee offices of AWARE Incorporated. I grew up in South Texas, and my parents currently reside in Burnet, Texas, with the result that I am well familiar with geologic and hydrologic conditions along and adjacent to the three proposed alternative routes for the All-American Pipeline. I have been involved in ground-water pollution control activities since 1961, having served approximately 16 years with the various Federal pollution control agencies, and since 1977 as a consultant to industry and governmental groups throughout the United States, Canada, and Australia. My academic training includes an undergraduate degree in Geological Engineering from the Colorado School of Mines and a graduate degree in Hydrology from Stanford University. I am a Registered Professional Geologist with the State of California.

During the time I spent with the various Federal pollution control agencies, one of my duties was as spill control coordinator for the Colorado River Basin Project, in

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LETTER 47

Arizona, California, New Mexico, Utah, Nevada, and Wyoming. During this time, I received EPA and FWPCA training in spill control technology, and was involved as on-scene coordinator for a number of oil spills in the canyons of Utah, Arizona, Colorado, and Nevada.

I have published numerous articles and have been qualified as an expert witness in the areas of hydrogeology, geochemistry, and contaminant transport at a number of public hearings and administrative proceedings. My main technical speciality is in the behaviour of contaminants, especially metals and radionvolides, in both the saturated and unsaturated (or vadose) zones. This includes the areas of unsaturated zone monitoring, vadose zone fluid transport, and subsurface contaminant reactions.

I was requested by the Travis County Attorney to review the information developed under the Environmental Impact Statement preparation procedures and to note those areas where there appears to be the need for additional investigations or development of additional data. I was also requested to address areas in which the draft Environmental Impact Statement appears to be inadequate or inaccurate. I previously appeared before the Scoping Hearing for the All-American Pipeline, held in Temple, Texas, and presented testimony including my professional qualifications statement at that time. I understand this material is included as a part of the overall record.

In my investigations, I have focused on three major areas. These include:

1. Stream bed scouring at stream crossings,
2. Control of oil spilled on turbulent rivers, and
3. Behaviour of contaminants contained within the crude in both the saturated and unsaturated zones.

LETTER 47

Each of these three areas is discussed in detail in the following material.

SUMMARY

47-1 In general, I concur with the stated Bureau of Land Managment preference for selection of the Northern Alternate. The northern route appears to have certain advantages in all three of my areas of concern.

As I noted in my scoping testimony, control of oil spills on a surface water body in a canyon environment or an area of high energy is definitely difficult to achieve. Spill control on surface water courses in the Northern Alternative would be easier, since these streams are commonly more placid, in comparison to the streams in the Central Alternative, with the Southern Alternative very difficult to achieve spill control due to the remote nature of many of the sites and the high energy environment in the canyon streams. This is recognized in the summary of the EIS, on page S-4, where it is noted that it is hard to control oil spills on canyon streams.

Stream bed scour and subsequent pipeline disruption also appears to be more likely along streams in the Central and Southern Alternatives, and less likely to occur along streams in the northern section. As will be expanded in subsequent discussion, it is difficult to understand the statements on page 3-21 and 4-41 where the stream crossings on bedrock outcrops are stated to have little potential for disruption. The excavation of a trench across such bedrock outcrop areas forms an area of much higher-than-normal errosion potential.

I was disappointed to see that the draft EIS contains no stream-crossing material similar to that which was presented in the earlier EIS for the California to McCamey section of the pipeline. It is impossible to evaluate the adequacy of the calculations in the absence of such calculations.

RESPONSE TO LETTER 47

47-1 Your comment regarding support for the Northern Alternative is noted.

LETTER 47

Much of the route along the Northern Alternative has a higher annual precipitation than either the Central or Southern Alternatives, with the result that there tends to be a lesser thickness of unsaturated material. Counter to what would be normal expectation, such an absence of a thick vadose zone makes the potential for mitigation of spills much easier. It would be virtually impossible to mitigate the effects of cross spills into the unsaturated zone within the Edwards Fault Zone Aquifer, with its high vertical permeability. The role of the unsaturated zone is well stated on page 4-30. As a result of the above stated factors, I again would like to state my concurrence with the BLM preference for the Northern Alternative as the route having the least potential for impact of the water resource.

PREDICTION AND CONTROL OF STREAM BED SCOURING

47-2 The Environmental Impact Statement indicates that the proposed plan is to bury the pipeline to allow for four feet of cover over the predicted depth of scouring, on the basis of stream scouring formulas associated with a storm of 24-hour, 100-year recurrence interval. As I noted in my scoping testimony, this can be translated to a storm which occurs as a result of a day-long rainfall event with a chance of occurence of one percent for any given year. The calculation of such one percent probability storms is a part of standard hydrologic techniques, and should be added to the tables on page 3-22, 3-121, and 3-182.

47-3 I was very disappointed to see that no calculations of stream crossing flows or depth of scour was presented in the draft EIS. This is totally unlike the EIS for the California to McCamey portion of the pipeline. In my view, the EIS is not complete due to the lack of stream crossings studies. All-American had previously

RESPONSE TO LETTER 47

47-2 The calculation of the 24-hour, 100-year storm event requires detailed investigation, including reviewing climatological records, geomorphic assessment, analyzing stream flow records, and assessing upstream and downstream conditions. This calculation is undertaken during detailed design. The maximum recorded flows summarized in revised Tables 3-6, 3-41, and 3-60 of Modifications and Corrections Section 3.2 indicate the relative size of major stream flows that have occurred in the past. Typically, the gauges listed have records of over 30 years in length with a maximum length of record of 68 years. It is probable that a rare event approaching or exceeding the 100-year flood has occurred historically.

47-3 General descriptions of the major crossings are presented in the Draft SEIS and are similar in context to the original EIS for the California to McCamey segment of the pipeline. A detailed description of the Brazos River crossing and scour depth has been added to the SEIS; please see the Modifications and Corrections section for page 4-35.

LETTER 47

47-3 Cont. conducted major investigations of stream crossing requirements for each of the major streams along the California to McCamey pipeline. The absence of such stream crossing information is a significant flaw in the present EIS.

47-4 It is difficult to understand the statements on page 3-21 and 4-41 relating to scour of those portions of the stream where the stream flows on bedrock. The statment is made that the pipeline will be keyed into bedrock and the excavation has little potential for scouring. Unless the trench is backfilled with a material of equal or greater resistance to scouring than the bedrock, the trench excavation serves as a potential site of extensive scouring. Backfilling of a bedrock excavated trench with normal excavated material would not have the same resistance to scour. In summary, the stream scouring sections as presented in the EIS appears to be less than complete.

47-5 My experience indicates that the potential for stream scour and subsequent disruption would be greater in the Central and Southern Alternatives, in comparison to the Northern Alternative, as a result of the stream gradient and physiography. On this basis, and in the absence of stream crossing studies, I conclude that the potential for disruption is probably less in the Northern Alternative. A part of the reason for this conclusion, and a subject not addressed in the EIS, is the disruption of natural shingling of alluvium along a stream section. Naturally-occuring alluvium tends to occur with the long dimension of all the grains in a parallel orientation. Excavation for a trench and subsequent backfill will destroy the shingling, with the resultant an increase in the potential for scouring. Since stream alluvium along the Northern Alternative tends to be finer grained in comparison to streams along the southern and central portion, the effect of such shingle destruction would appear to be lessend.

RESPONSE TO LETTER 47

47-4 When crossing a channel that is bedrock-controlled, a trench will be blasted or ripped for pipe placement. The width of the trench will be kept to a minimum and is expected to be on the order of 5 to 8 feet to minimize its effects on the river. The trench will be backfilled with a few inches of alluvium to act as bedding for the concrete-coated pipeline. The minimum depth of burial in competent bedrock is 18 inches. Backfill material is expected to consist of alluvium and blast rock. This backfilled material may scour out of the trench and expose the pipe; however, exposing the pipe will not necessarily jeopardize the integrity of the pipeline, and the scoured material should not constitute a major source of sedimentation downstream. When the pipeline is exposed, the concrete coating will protect the pipeline from large rocks that may deposit in the trench. During the receding leg of the hydrograph, sediment from upstream sources will deposit in the trench and cover the pipe. Erosion of the competent bedrock from hydraulic action is not expected to be excessive over the lifespan of the pipeline, and 18 inches of cover should be adequate.

47-5 Shingling, which is a natural process in armoring of the bed in coarse bed rivers, will be disrupted during placement of the pipe and subsequent backfilling; however, scouring action will be localized and short-term and will stabilize when the bed re-armors itself. The backfilled bed material will scour when the shear stress is capable of transporting part or all of the material. At this point, usually only the smaller diameter particles of the material are transported downstream. As the fine material is eroded, the larger diameter particles settle into the vacated areas of the sublayer. A new armor coat develops either by the bed scouring down to the larger bed material or by settlement of larger particles that are saltating or in suspension. Disruption of the armor layer is taken into account during the design process.

LETTER 47

OIL SPILL CONTROL ON INLAND RIVERS

47-6 The spill control contingency plan presented in the EIS utilizes experience which has been gained on a number of inland oil spills in low-energy streams. As is noted on page S-4, such spill control is difficult to achieve in streams of higher energy, typical to the central and southern portions. As I noted earlier, I was responsible for spill control activities in the canyon lands of the desert southwest. In many cases, we were forced to merely wait and watch the spill migrate until it reached a reservoir, which offered a chance for control. The normal spill control techniques are not suited for control of spill on high-energy canyon streams.

SATURATED AND UNSATURATED ZONE BEHAVIOR OF CRUDE CONSTITUENTS

47-7 The EIS inadequately discusses the components of the crude oil proposed for shipment, in that it does not present any range of concentrations for inorganic constituents,especially heavy metals and metaloids, associated with the oil. Such ranges of concentrations should be addressed, since the California crudes frequently contain metals. It was gratifying to note that the concentrations of various light voluble constituents were included in the EIS.

47-8 Behaviour of the contaminants in a spill must address behaviour both in the saturated and the unsaturated zone. The draft EIS does recognize the solubility of some of the light fractions such as benzene and toluene which would be contained in spills and recognizes the fact that such soluble fractions can move with the ground-water, rather than staying on the ground-water surface. Again, the report should also address the potentially mobile inorganic constituents contained with the material.

RESPONSE TO LETTER 47

47-6 Your comment regarding the Oil Spill Contingency Plan is correct. Please refer to the Modifications and Corrections section for page B-31.

47-7 Your comment regarding concentrations of trace inorganics is noted. Please refer to revised Appendix A, Sections 1.1 and 1.4, in Modifications and Corrections Section 3.3 of the Final SEIS.

47-8 Your comment regarding the behavior of crude constituents is noted. Please refer to revised Appendix A, Sections 1.1 through 1.4, in Modifications and Corrections Section 3.3 of the Final SEIS.

LETTER 47

The draft EIS also recognizes the importance of spills which might adhere to rocks of the vadose or unsaturated zone, and then serve as a potential source of contamination to the underlying ground-water for a period of years. The role of the vadose zone is fairly well stated on page 4-30. With this in mind, Appendix C does not truly represent a worse case scenario, since the hypothetical event includes a rather significant rain storm which would result in a water wetting of the unsaturated zone which, in turn, reduces the adherence of contaminants to the rock fracture faces. The description on page 4-23, with regards to the ~~shell~~ Shell spill is relevant, but it is noted that only a single monitor well, approximately 1,500 feet from the spill, has been drilled. It is not correct to conclude that there has been no ground-water contamination, based on the results of a single monitoring well. I do not agree with the statements on page 4-28, which indicate a low potential for contamination in those areas where the water table is over 100 feet deep. Such an extensive vadose zone rather can serve as a long-term source of contamination to the underlying ground-water during periods of infiltration. In line with this concern, I have a concern for the possible existence of long-term undetected leaks from pinhole defects in the pipeline, which could have a much greater cumulative effect than the postulated instant failure of the pipeline. The permeable backfill which would be along much of the pipeline trench can allow lateral migration of oil from such small leaks throughout a long length of pipeline trench, and result in contamination of a large quantity of unsaturated zone material.

47-9

47-10

47-11

SUMMARY

Again, I would like to state my concurrence with the BLM and its selection of the Northern Alternative as the construction alternative having the least potential

RESPONSE TO LETTER 47

47-9 The Onion Creek to Edwards Aquifer oil spill scenario has been revised; please refer to Appendix B of the Final SEIS.

47-10 The language of this section has been clarified to reflect the limitations of the studies done to date regarding the Shell Pipeline oil spill. Please refer to response to Comment 33-3.

47-11 Your comments regarding contamination of the vadose zone in the upper 100 feet of soil are noted.

LETTER 47

for impact of the ground-water resource. The draft EIS addresses a number of points, but is not adequate in its treatment of the potential stream scouring associated with stream crossings, and inadequately discusses the inorganic constituents of the crude proposed for transport. The EIS does recognize the importance of contamination of the vadose zone as a source of continuing contamination to the ground-water, and similarly recognizes the difficulty in controlling spills on surface water courses in high-energy environments.

RESPONSE TO LETTER 47

LETTER 48

Box 647
Kyle,Texas,78640
March 16,1987
Phone: (512) 268 0231

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, Ca.,92507

Dear Sir:

There are two things that I want to tell you about why I am against the All American Pipeline crossing the aquifer in Hays County,Texas.

First, about past leaks that occurred when and before I worked for a pipeline company. I worked for this pipeline co. from 1943 to 1964 and it pumped various West Texas and New Mexico crude oil. The other thing that I am also going to tell you about is the recharge zone that I have watched for 57 years on the Blanco River.

Leaks on 12" main line from New Mexico to Houston,Texas:

48-1 I found a leak on what was then known as the Wren Ranch and now Fulton Ranch today. This leak occurred about 1 mile east of the Blanco river up and over the old road which climbs from the river bed to 200 ft. As I was walking the pipeline and following the rocky back fill, I heard a loud spewing noise. There was no oil visable on the surface,and this spewing noise was caused by oil escaping from the pipe. What brought this leak to our attention was the pressure drop at the pump station we st of Wimberley.When the leak was dug out and clamped off the ditch was back filled, and there was no reason for any futher clean up because the oil had found its way down into the ground, and I assume into a cave. This kind of leak can not be detected by air patrol as it is done now days.

RESPONSE TO LETTER 48

48-1 Aerial reconnaissance is only one of several leak detection methods to be employed by AAPL. Please refer to pages 2-31 through 2-33 in the Draft SEIS for additional data on this topic.

LETTER 48

2..

The other leak was on the west side of the Blanco River in the Flight Acres area where the pipeline crossed the river. This leak was a rough one as told to me by one of the mem that helped repair it. It occurred gefore I started to work. He said that oil covered the upper still waters as for down as the Howell Ranch where the oil was blocked on the water surface by floats. This covered a distance of around 3 miles. In those days oil was burned on top of the water when enough of it could be trapped and the residue was skimmed off. It has been my experience that most leaks that occur are caused by some man failure however there are the ones that occur by the lack of electrolysis control, and in connection with it comes man again in not applying proper outside pipe protective coating. Some of the worst leaks that I have seen were when the line was put into operation.

48-2

A recharge area in the Blanco River in the Haifax Pool at the mouth of Halifax canyonis about 4 air miles west of Kyle on the Nance, Decker, Greg, and Jack Johnson ranches. A report from the Texas State Water Board stated according to the hydrologist that there is more water flowing into the Halifax pool than flowing out. In drouth conditions you may go in a boat or anyother way you wish and see where the water is sucked into the banks of Halifax Canyon mouth,and whirl pools are also noticeable where water is going into caves. A lot of the water is absorbed in the gravel bank on the south lower end of the Halifax Pool. When we have a flood there is a hole on the west bank of the upper end of the pool where water goes into the ground. This hole is in soft dirt and its location changes position on the surface nearly evertime after a flood. When the aquifer is full , springs are noticeable in some areas which is a reverse condition of the above.

48-3

Sincerely yours,

W. S. Decker

RESPONSE TO LETTER 48

48-2 Thank you for your comment. We agree that human error plays a distinct role in system safety and reliability. Pages 4-10 through 4-13 of the Draft SEIS discuss the historical causes of pipeline spills. Please refer to Appendix B of the Draft SEIS which includes an Oil Spill Contingency Plan and Emergency Response Plan in the event that a human and/or mechanical error occurs.

Oil spill cleanup techniques on open water have improved in recent years with the use of skimmers, booms, and emulsifiers. Please refer to the Oil Spill Contingency Plan in Appendix B of the Draft SEIS for oil spill cleanup details.

48-3 Your comment regarding the recharge zone along the Blanco River in Hays County is noted. Please refer to pages 3-7 and 3-8 of the Draft SEIS and Modifications and Corrections Section 3.3 for page 3-8 of the Final SEIS which identifies the affected environment along the proposed pipeline route, including the Edwards Plateau Aquifer.

LETTER 49

LAW OFFICES OF
Calvin C. Otte, Inc.
ATTORNEYS AND COUNSELORS AT LAW

13800 MONTFORT SUITE 225
DALLAS, TEXAS 75240
(214) 387-2500

REPLY TO:
P.O. BOX 802434
DALLAS, TEXAS 75380

March 16, 1987

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverdale, CA 92507

RE: ALL AMERICAN PIPELINE

Dear Haigh:

49-1 The purposed route of the All American Pipeline passes through my families farm, and we are **extremely** opposed to the purposed route going through or by Fredericksburg, Texas. The main and foremost objection to the pipeline is always related to the problem of an oil spill over underground water aquifers. Mainly the Edwards underground aquifer and then of course it passes within less than half a mile from the water supply of the city of Fredricksburg.

49-2 The enclosed article of the Dallas Morning News of Monday, March 9, 1987 I think strongly supports the concerns of the people for a fresh water supply.

It must be pointed out that all the spills that occured have occured since October 1985.

Thanking you for a very kind consideration in this matter, I remain

yours very truly,

Calvin C. Otte

CCO/lh

cc: Mr. and Mrs. Chester Otte
332 West Hackberry
Fredericksburg, Texas 78624

RESPONSE TO LETTER 49

49-1 Your comment regarding your opposition to the selection of the Proposed Route is noted. Thank you for the newspaper article that you provided on pipeline spills.

49-2 Thank you for the information on the gasoline spills from the Chevron Pipeline and the recent Mineral Wells spill. Although such a spill from the All American Pipeline cannot be ruled out, the design features of the All American Pipeline make it considerably safer than the pipeline which affected Mineral Wells. AAPL's design includes several features to reduce the likelihood of corrosion leaks. Please refer to pages 2-5 through 2-7 in the Draft SEIS for details on these features. Please also refer to the Modifications and Corrections section for pages 2-37 and 4-172 which discuss the existing crude oil pipelines in Texas.

The Mineral Wells spill was of gasoline which is much higher in lighter, more toxic petroleum fractions.

TEXAS & SOUTHWEST

Pipeline has history of spills; state investigation planned

By David Hanners
Staff Writer of The News

AUSTIN — The aging Chevron pipeline that leaked nearly 17,000 gallons of gasoline and tainted Mineral Wells' water supply with a cancer-causing chemical Feb. 27 has broken at least three other times since June, state records show.

The previous leaks spilled more than 31,000 gallons of diesel fuel, regular, unleaded and super-unleaded gasoline in three counties, causing an estimated $25,000 damage but no reported injuries, according to records at the Texas Railroad Commission.

The series of leaks has prompted the commission to launch an in-depth investigation of the pipeline, which stretches through 26 Texas counties from Port Arthur on the Texas Gulf Coast to Eastland, west of Fort Worth. That review is to begin Monday, said Milt Fegenbush Jr., director of the agency's Pipeline Safety Division.

"We are going to get into that pipeline in intimate detail starting Monday," said Fegenbush. "With this one, we're probably going to take two or three weeks because of all the problems with the accidents."

Officials with Chevron Pipe Line Co. said the company would cooperate with the inquiry. "We're not hiding anything," said Jim Nuckols, an environmental specialist with Chevron who was sent to Mineral Wells to help city officials after the leak.

Since the Railroad Commission began regulating hazardous-liquid pipelines in October 1985, Chevron has compiled the worst record among the 19 companies that have reported leaks. Nearly one in every four pipeline spills investigated by the agency occurred on a Chevron line.

Commission records show that before the Mineral Wells leak, Chevron had 11 of the 46 spills reported. In all, an estimated 182,910 gallons of various petroleum products leaked out from Chevron lines since May, causing an estimated $32,850 damage.

TEXAS INTRASTATE PIPELINE SPILLS

This is a list of companies reporting hazardous liquid pipeline spills to the Texas Railroad Commission since it began regulating intrastate pipelines in October 1985. The list gives the name of the company, the number of spills reported, the barrels spilled and estimated property damage (the damage estimate includes the cost of the petroleum product lost):

Amber Pipeline Co. — one spill, 1,000 barrels of product lost, $68,000 damage.

American Petrofina Co. of Texas — one spill, 110 barrels of product lost, $40,000 damage.

Amoco Pipeline Co. — three spills, 4,280 barrels of product lost, $235,400 damage.

Chevron Pipe Line Co. — 11 spills, 4,355 barrels of product lost, $32,850 damage.

Coastal States Crude Gathering Co. — one spill, 1,583 barrels of product lost, $30,000 damage.

Comyn Pipeline Co. — one spill, 568 barrels of product lost, no damage estimate.

Diamond Shamrock Corp. — one spill, 1,800 barrels of product lost, $14,000 damage.

Exxon Pipeline Co. — seven spills, 12,157 barrels of product lost, $121,450 damage.

Fina Oil & Chemical Co. — two spills, 2,570 barrels of product lost, $86,500 damage.

Mid-America Pipeline — one spill, five barrels of product lost, $25,000 damage.

Mobil Oil Co. — one spill, 51 barrels of product lost, $1,350 damage.

Mobil Oil Corp. — one spill, 850 barrels of product lost, $45,000 damage.

Mobil Pipeline Co. — five spills, 1,000 barrels of product lost, $45,616 damage.

The Permian Corp. — one spill, 545 barrels of product lost, $1,500 damage.

Phillips Pipe Line Co. — four spills, 1,144 barrels of product lost, $14,109 damage.

Scurlock Oil Co. — one spill, 100 barrels of product lost, $3,000 damage.

Seadrift Pipeline Corp. — one spill, 650 barrels of product lost, $21,600 damage.

Texas Pipeline Co. — two spills, 2,392 barrels of product lost, $2,000 damage.

Trans-Tex Mineral & Royalty Corp. — one spill, no estimates for product lost or damage.

SOURCE: Texas Railroad Commission

The Dallas Morning News

cathodic protection — a "sacrificial" anode rusts instead of the pipe.

According to the Railroad Commission, the previous reported leaks on Chevron's Port Arthur-to-Eastland line include:

■ June 11, 1986, Johnson County — 12,600 gallons of diesel and super-unleaded fuel leaked, causing an estimated $5,000 in damage.

more than five barrels — 210 gallons — must be reported to the Railroad Commission. Of the reported accidents — including the Mineral Wells leak — 45 percent were caused by corroded pipe.

In addition, 28 percent were caused by an outside force, such as a private contractor inadvertently digging up the pipeline.

The reported accidents have

ucts leaked out from Chevron lines since May, causing an estimated $32,850 damage.

Seven of Chevron's leaks were caused by corroded pipe or a weld that failed. Only one was caused by incorrect operation, the records show.

Nuckols said the company has made an effort to upgrade its pipeline, and had compiled an exemplary worker safety record.

"We're not bad guys," said Nuckols. "We don't do *everything* right, but we're not out here with reckless disregard for the public."

Chevron plans to spend $34 million in a five-year program to upgrade the Port Arthur-Eastland line, and the firm recently spent $7 million to replace a 42-mile section, Nuckols said.

Nuckols also stressed that fixing the aged pipeline was an expensive undertaking, and the oil-price crisis has not made such expenditures easy for oil companies.

The Mineral Wells pipeline leak was detected by Chevron workers the evening of Feb. 27. Before they were able to stop the flow, 16,800 gallons of gasoline had leaked from the pipe.

The gasoline entered a creek that feeds Palo Pinto Lake, Mineral Wells' water supply. After city residents complained that their water smelled of gasoline on March 1, city officials ordered that it not be used for drinking.

Tests showed that the water contained higher than allowable levels of some chemicals, including benzene, which the U.S. Environmental Protection Agency says can cause cancer.

Chevron brought in nearly 100,000 gallons of bottled water for free distribution. Continued tests of the city's water showed the toxins dropping below detectable levels, and residents were allowed to drink their tap water again during the weekend.

The 10-inch pipeline leaked because it corroded, Nuckols said.

Railroad Commission records show that the other three leaks reported on the line in the past year also were caused by corrosion.

The section of bare-steel pipe that corroded near Mineral Wells was 30 years old. But records show two of the previous reported leaks on the line were from sections of pipe that were 58 years old — a situation that is not uncommon in Texas, said Fegenbush.

Also, the pipe is bare steel, which no longer is allowed in new pipe. New pipe must be coated and wrapped with various coverings. It also must be protected against corrosion by an electrical means called

— 12,600 gallons of diesel and super-unleaded fuel leaked, causing an estimated $5,000 in damage.

■ July 9, 1986, Erath County — 1,680 gallons of regular gasoline leaked, with no damage estimated.

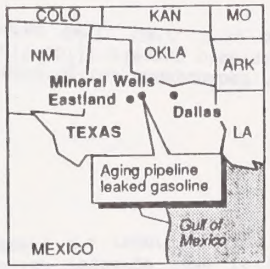
■ Feb. 21, Navarro County — 16,800 gallons of unleaded gasoline spilled 3 miles northwest of Wortham. Damage was estimated at $20,000.

So far, officials have not figured a damage estimate for the Mineral Wells leak.

Fegenbush's 46-person Pipeline Safety Division is responsible for regulating the estimated 80,000 miles of hazardous-liquid pipeline in Texas. Interstate pipelines are regulated by the U.S. Department of Transportation.

The Railroad Commission began regulating intrastate pipelines in 1985. Before that, they were regulated by the federal government, which didn't always monitor closely, said Fegenbush.

When his division inherited hazardous-liquid pipeline regulation, he said, there were few, if any, records or documents. His office



The Dallas Morning News

didn't know how many pipelines were out there, where they stretched or what they carried.

"There was nothing. We had to begin from ground zero," said Fegenbush. "We're still in a quantifying situation, trying to determine what is there."

The Railroad Commission began its documentation by sending questionnaires to the 223 companies that had permits for transporting hazardous liquids, asking them to give details about their systems, said Fegenbush.

All the companies responded, and he said he now thinks the state at least has a handle on the scope of what it is regulating.

Commission records show that a wide range of chemicals flow through the 6,000 pipeline systems in Texas. The products range from crude oil to regular gasoline to butane propylene to liquid propane gas.

The law says that any leak of

caused by an outside force, such as a private contractor inadvertently digging up the pipeline.

The reported accidents have spilled nearly 1.5 million gallons of petroleum products in Texas, causing an estimated $748,175 in damage. In Railroad Commission estimates, the value of the product lost in the spill is included in the damage estimate.

The leaks vary in size. The smallest reported spills were a 5-barrel spill of natural gas liquid from a Mid-America Pipeline pipe on Sept. 3, 1986, and a 5-barrel spill of natural gas liquids from a Mobil Pipeline Co. line on Jan. 11.

The largest reported accident was an 8,000-barrel spill of crude oil from a corroded Exxon Pipeline Co. line on Nov. 18, 1985, according to state records.

State pipeline safety officials have handed out 1,417 citations to pipeline companies for problems since state regulation began. And while the law allows the Railroad Commission to assess civil and criminal penalties — ranging from a $50 fine to a $25,000 fine and 5 years in prison — it has never fined anyone.

"We really have gotten reasonable compliance," said Fegenbush. "We're working on some cases that could lead to fines, though."

He said the agency is still looking at Chevron's actions in the Mineral Wells leak. And Fegenbush had some harsh words for the company.

"They did not timely report it to us. They reported it days late," said Fegenbush.

The law says the Railroad Commission must be notified of a spill by telephone within two hours of discovery, and the company must file a written report with the agency within 30 days.

Nuckols disputed Fegenbush's assertion, saying the commission was notified soon after the spill was discovered.

Although Fegenbush's division began with only three employees, the 46 people it currently has throughout the state is down from the 52 it had last year.

Fegenbush said he still thinks the division has a way to go in making its records as comprehensive as possible. He said that while the federal government has cooperated in helping Texas get into the business of regulating intrastate pipelines, the government didn't have a lot of records to turn over to the state.

"The feds can't even give me a list of *interstate* pipelines in Texas. They don't know," said Fegenbush. "I still think it's going to be interesting when we find out all the things these pipelines carry."

LETTER 50

1403 Post Oak Circle
College Station, Texas 77840
March 17, 1987

Public Affairs Officer
U. S. Bureau of Land Management
1695 Spruce Street
Riverside, CA. 92507

Dear Sir:

We have received and reviewed your Supplemental Impact Statement in regard to the All American Pipeline Company's proposed route from McCamey, Texas, to Webster, Texas.

50-1 You are to be commended for making such a detailed and thorough study of all the problems involved and in interpreting the effects of the proposed pipeline upon the people, the vegetation, the environment, and upon the possible destruction of the rare and endangered species along the three routes you have studied of the pipeline from McCamey to the Texas coast. We are hearily in agreement with you in the naming of a Northern route as the preferred alternative, and thus avoiding the Edwards Aquifer and its recharge zone, the most sensitive and most easily destructive permanently of any water supply along the three routes studied. We feel, however, that you should be more clear and forceful in declaring that the proposed central route across the Edwards Aquifer is unacceptable.

50-2 Our ranch is in northern Hays County and astride the central proposed route of the All American Pipeline, and our farm is about a mile and a half to the southeast of Kyle. The Edwards Aquifer is our principal source of water for livestock, game, general agricultural purposes, and human consumption. The area is underlaid by a vast honey-combed, porous sandstone rock formation, which, with the known caves in the area, would make it impossible to clean up any major oil spill that might penetrate into this porous, cavernous rock formation. Penetration into the formation would be rapid, and the oil would be irretrievable.

In 1925 when my Father had a water well drilled on the ranch, the drill bit, after penetrating some thirty to forty feet, suddenly dropped fifty or sixty feet, having struck a cave. The well has never gone dry, and the water is good. On the ranch there are a number of sink-holes, and when it rains the water runs off into these holes, and so would oil from any break in a pipeline. On this small ranch of less than a section of land, there is one, and possibly more, cave(s) opening to the surface and from which air comes out. Rainwater runs into these underground, subterranean water reservoirs. We want to emphasize that in case of any pipeline break oil would quickly reach the underground reservoirs, causing irreparable and eternal damage to the water supply and adversely affecting the lives of hundreds of thousands of people. It would be impossible to clean up the spill. Any spills of oil along the proposed Nortern route could be cleaned up quickly and satisfactorily for the water supplies there are largely from rivers and lakes and from a different type of formation than that containing the Edwards Aquifer.

50-3 There is no certainty that a pipeline line, no matter how well constructed, might not break at any time. Your estimate of a possible eight breaks over the life of the proposed pipeline seems to be too low. A Chevron pipeline that runs near Mineral Wells, Texas, has broken at least four times since June, 1986, and on February 22, 1987, the break that occurred polluted the water supply of the City of Mineral Wells with a cancer-causing chemical. Fortunately, the line did not cross the Edwards Aquifer, and in a few days they were able to clean up the contaminating spill.

RESPONSE TO LETTER 50

50-1 Your comment in support of the Northern Alternative and in opposition to the Proposed Route based on potential groundwater contamination of the Edwards Aquifer recharge zone is noted. Please refer to the response to Comment 1-1 regarding the vulnerability of the Edwards Aquifer.

50-2 Your comment regarding the honeycombed nature of the Edwards Aquifer and associated oil spill cleanup problems is noted. Please refer to Mitigation Measures GW-1, GW-2, G-1, and G-2 in Appendix A of the Final SEIS.

50-3 Please refer to the response to Comment 49-2 for a discussion of the Mineral Wells pipeline spill.

LETTER 50

50-4 Care must be taken in coming to any understanding and agreement with All American PipelineCompany that there is clarity as to what is permissible and what is not permissible for it to do in construction of any pipeline. The Company is known to have made misstatements and given false impressions, bringing into serious questions its veracity, as shown by the attached document filed on March 5, 1987, by Attorneys Fowler, Gibson & Moran of Odessa, Texas, in behalf of Key Enterprises, Inc., with the Oil and Gas Division of the Railroad Commission of Texas. The All American Pipeline Company, it is charged, had contracted with R. B. Potashnick and Key Enterprises, Inc., to dig a 30-inch trench from McCamey, Texas, to Kyle, Texas, "warranting," according to the attorneys, "that all necessary regulatory approvals had been obtained to build this pipeline, when in fact, the contrary was true."

If neither the Northern or the Southern route, as outlined by you, is acceptable to the All American Peopleline Company, then we recommend that no permit be given to All American Pipeline Company or to any similar company to build a pipeline from McCamey to the coast, and certainly never across the Edwards Aquifer and its recharge zone.

Sincerely,

J. M. Nance

J. M. Nance

Eleanor Hanover Nance

Eleanor H. Nance

RESPONSE TO LETTER 50

50-4 The BLM will provide an Authorized Officer to supervise compliance with permit stipulations during construction. The Texas Attorney General will coordinate state assistance with compliance activities.

FOWLER, GIBSON & MORGAN
ATTORNEYS AT LAW

GEORGE L. FOWLER
G. WILLIAM FOWLER
JAY GIBSON
J. T. MORGAN
DAVID B. EDWARDS

P.O. Box 2992, 115 West Fifth Street · Odessa, Texas 79760
(915) 582-7555

RECEIVED FEB 0 6 1987

March 5, 1987

Ms. Meredith Kawaguchi
Hearings Examiner
Oil & Gas Division
Railroad Commission of Texas
P. O. Drawer 12967
Capitol Station
Austin, Texas 78701-2967

RE: DOCKET NO. 1-86,589
ALL AMERICAN PIPELINE COMPANY

Dear Examiner Kawaguchi:

On behalf of Key Enterprises, Inc., please find enclosed for filing an original and three (3) copies of Petition to Intervene. A copy of same has been mailed to each person shown on Exhibit "A", which I understand to be the latest service list in this proceeding.

Please advise if there are any additional parties who should be notified of our Petition to Intervene.

Your prompt attention in responding to this petition would be greatly appreciated. With best regards, I remain

Very truly yours,

G. William Fowler

GWF/at
Enclosures

cc: Key Enterprises, Inc.
All parties of record

2-172

RAILROAD COMMISSION OF TEXAS

OIL AND GAS DIVISION

RECEIVED
R. R. C. OF TEXAS
MAR 5 1987
O. G.
AUSTIN, TEXAS

HEARING ON MOTION OF THE	§	
RAILROAD COMMISSION OF TEXAS	§	
TO CONSIDER THE APPLICATION	§	
OF ALL AMERICAN PIPELINE	§	
COMPANY FOR AN OPERATING	§	
PERMIT FOR ITS CRUDE OIL	§	
PIPELINE FROM McCAMEY TO	§	OIL AND GAS DOCKET
WEBSTER, TEXAS, AND PROPOSED	§	NO. 1-86,589
ROUTE THROUGH UPTON, CROCKETT	§	
SUTTON, KIMBLE, KERR,	§	
GILLESPIE, BLANCO, HAYS,	§	
CALDWELL, BASTROP, FAYETTE,	§	
COLORADO, WHARTON, FORT BEND,	§	
BRAZORIA, GALVESTON AND	§	
HARRIS COUNTIES, TEXAS	§	

PETITION TO INTERVENE

TO THE HONORABLE RAILROAD COMMISSION OF TEXAS:

COMES NOW, KEY ENTERPRISES, INC. and files this its Petition to Intervene and would show the Commission as follows:

I.

KEY ENTERPRISES, INC., a Texas corporation, was the approved sub-contractor hired to dig a segment of the trench (1,457,000 linear feet) from McCamey, Texas, to Kyle, Texas, for All American Pipeline Company's thirty inch (30") heated crude oil pipeline. All American Pipeline Company had contracted with R. B. Potashnick and Key Enterprises, Inc. warranting that all necessary regulatory approvals had been obtained to build this pipeline, when in fact, the contrary was true. On or about January 7, 1986, All American Pipeline Company gave R. B.

Potashnick, the general contractor, a notice to proceed on the construction of the pipeline from McCamey, Texas, to Kyle, Texas. On or about January 15, 1986, Potashnick gave a notice to proceed to Key Enterprises, Inc., who individually began ditching operations in an eastwardly direction from McCamey, Texas. On or about the 13th day of March, 1986, Key Enterprises, Inc. was notified to halt the ditching work and on or about the 25th day of July, 1986, Key Enterprises, Inc. was notified that All American Pipeline Company had terminated the construction contract with R. B. Potashnick and its subcontractors.

II.

Key Enterprises, Inc. seeks to intervene in this permiting proceeding as a party with all rights of discovery and presentation and cross-examination of witnesses. Key Enterprises, Inc., as an interested party, may have information that will be material to this proceeding. The granting of this petition will not delay the Commission's actions in resolving the issues pending before it.

WHEREFORE, PREMISES CONSIDERED, Key Enterprises, Inc. respectfully prays that the Commission grant this Petition of Intervention, admitting Key Enterprises, Inc. as a party and for such other and further relief it may show itself justly entitled.

RESPECTFULLY SUBMITTED,

FOWLER, GIBSON & MORGAN
ATTORNEYS AT LAW
P. O. BOX 2992
115 WEST FIFTH STREET
ODESSA, TEXAS 79760
(915) 332-7388

BY: G. William Fowler
G. WILLIAM FOWLER
State Bar No. 07321000

ATTORNEYS FOR KEY ENTERPRISES, INC.

CERTIFICATE OF SERVICE

I hereby CERTIFY that a true and correct copy of the above and foregoing Petition to Intervene has been forwarded on the 5th day March, 1987, via regular mail, postage prepaid to each of the parties shown on the attached Exhibit "A" (service list for All American Pipeline Company).

G. William Fowler
G. WILLIAM FOWLER

SERVICE LIST FOR ALL AMERICAN PIPELINE

Dan Moody
P.O. Box 98
Austin, Texas 78767

Roy Rutland
1600 MBank Tower
Austin, Texas 78701

Dick Brown
650 MBank Tower
Austin, Texas 78701

Philip Pfeiffer & Robert Gulley
Fulbright & Jaworski
2200 InterFirst, 300 Convent
San Antonio, Texas 78205

Robert Wilson
1300 Capitol Center, 919 Congress
Austin, Texas 78701

Jay Weinheimer
P.O. Box 930
Fredericksburg, TX. 78624

Joe Nance
P.O. Box 5577
Bryan, Texas 77805

Don Hensley
1910 Spillers
Houston, Texas 77043

Texas Water Commission
1700 Congress
Austin, Texas 78701

Congressman J.J. Pickle
763 Federal Bldg.
Austin, Texas 78701

Senator Gonzalo Barrientos
P.O. Box 12068, Capitol Station
Austin, TX. 78711

Senator Bill Sims
P. O. Box 12068
Capital Station
Austin, Texas 78711

Representative Lena Guerrero
P.O. Box 2910
Austin, Texas 78769

Representative Anne Cooper
1503 B. Aquarena Springs Dr.
San Marcos, Texas 78666

Representative Gerald Geistweidt
P.O. Drawer P
Mason, Texas 76856

Representative Bob Richardson
P.O. Box 2910
Austin, Texas 78769

Judge Mike Renfro
P.O. Box 1748
Austin, Texas 78767

Mayor Frank Cooksey
P.O. Box 1088
Austin, Texas 78767

Judge Walter Burnett
Hays County Courthouse, Rm. 103
San Marcos, TX. 78666

Mayor Peter Stone
P.O. Box 1218
Buda, Texas 78610

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Buda, TX. 78610

Sally Shipman
P.O. Box 1088
Austin, Texas 78767

Clyde R. Roberts
Route 2, Box 83
Lockhart, TX. 78644

Bob Spain
4200 Smith School Rd.
Austin, Texas 78744

T.J. Higginbotham
P.O. Box 1050
Buda, Texas 78610

Robert Neblett
Small, Craig, Werkenthin
2500 InterFirst Tower
Austin, Texas 78701

EXHIBIT "A"

LETTER 50 (CONTINUED)

Rodger M. Zimmerman for F. W. Zimmerman, Jr.
Rt. 1, Box 74
Driftwood, Texas 78619

Representative Phyllis Robinson
P. O. Box 2910
Austin, Texas 78769

Representative Edmund Kuempel
P. O. Box 2910
Austin, Texas 78769

City of Austin
Department of Planning & Growth Management
OERM - Laura De La Garza
P. O. Box 1088
Austin, Texas 78767

Senator Cyndi Krier
P. O. Box 12068
Austin, Texas 78711

Diane Smith
Kyle Eagle
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Kyle, Texas 78640

Ben A. Wallis, Jr.
7550 IH 10 W #680
San Antonio, Texas 78229-5813

Ellen Salyers
House Environmental Affairs Committee
P. O. Box 2910
Austin, Texas 78769

Rep. Anne Cooper
P. O. Box 2910
Austin, Texas 78769

G. W. Longserre
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Thompsons, TX 77481

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Danville, KY 40422

Guy H. Fowler
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Representative Edmund Kuempel
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P. O. Box 1225
Danville, KY 40422

Guy H. Fowler
900 West Valley Road
Suite 201
Wayne, PA 19087

LETTER 51

Anne Cooper
State Representative
District 47
Blanco, Hays, Llano, Travis Counties

March 17, 1987

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

Two years ago this month I became aware of the intention of All American Pipeline to route a pipeline through this area and over the recharge zone of the Edwards Aquifer. I have been involved in the proceedings since then.

51-1 I certainly concur with the recommendation of the BLM in its Supplemental Environmental Impact Statement that the Northern route is preferable to the route presently proposed by All American Pipeline. It is my contention that this should also be the conclusion of the Texas Railroad Commission.

I appreciate the efforts of the parties involved in providing a study of the impact that the pipeline would have on the recharge zone of the Aquifer.

Sincerely,

Anne Cooper

ANNE COOPER
State Representative

AC:gr

P.O. Box 2910 • Austin, Texas 78769 • (512) 475-2195

RESPONSE TO LETTER 51

51-1 Your comment regarding support of the Northern Alternative is noted as is your concern for a potential oil spill over the recharge zone of the Edwards Aquifer. Please refer to the response to Comment 1-1 regarding the vulnerability of the Edwards Aquifer to an oil spill.

ESPEY,
HUSTON &
ASSOCIATES, INC.
Engineering & Environmental Consultants

COMMENTS ON PROPOSED ALL AMERICAN PIPELINE PROJECT DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Submitted to:

Bureau of Land Management
U.S. Department of Interior

on behalf of

County of Travis
County of Hays
County of Gillespie
City of New Braunfels
Texas

Submitted by:

Espey, Huston & Associates, Inc.

Tom Van Zandt, Project Manager
James Wiersema, Associate Ecologist
Clifton Ladd, Staff Biologist
Gilbert Ward, Senior Ground-Water Hydrologist

March 1987

916 Capital of Texas Highway South • P.O. Box 519 • Austin, Texas 78767 • (512) 327-6840 • Telex 776439

LETTER 52

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III.	Terrestrial Ecology	
IV.	Geology/Ground Water	

LETTER 52

ESPEY, HUSTON & ASSOCIATES, INC.

I. GENERAL EVALUATION OF METHOD AND CONCLUSIONS

52-1 I would like to thank the Bureau of Land Management for this opportunity to comment on the All American Pipeline Draft Supplemental Environmental Impact Statement (DSEIS), and to congratulate the agency and its consultant, ERT, on their performance under a very tight timetable. More importantly, I would also like to congratulate the Bureau of Land Management, the Travis County Commissioners Court, and everyone else for about six counties for making the right decision in your selection of the preferred alternative. Because we recognize that this is a tentative statement of preference at this point in the NEPA process, and because as a result of your selection of the northern pipeline alternative a great deal of additional attention will be paid to that alignment, we would like to put on the record several comments directed toward improving the Supplemental EIS in its final form, and thereby better substantiating and documenting the wisdom of BLM's decision.

52-2 During the Scoping Process, a comment made in various guises by several commenters was the importance of an integrated comparative analysis of the three alternative pipeline routes. This kind of "apples and apples" comparison, substantiated by an appropriate amount of data, is what the Council of Environmental Quality is talking about when it states that the alternatives analysis is "the heart of the EIS". In providing a rationale for its identifying the northern route as the preferred alternative, BLM states that a pipeline crossing the Edwards Balcones Fault Zone Aquifer can be shown to have a small probability of a pipeline break producing an oil spill. "However, should a break occur," the document continues at Section 2.7.2.1, "the spill very likely might penetrate into the aquifer in a worst-case situation (a break near a creek, particularly during a rain)". The most important things said in this section about the other two alternatives is that they do not cross the Edwards Balcones Fault Zone Aquifer.

RESPONSE TO LETTER 52

52-1 Your comment regarding support for the Northern Alternative is noted.

52-2 This comment addresses two issues: 1) an "apples to apples" comparison of impacts with appropriate support data, and 2) the Edwards Balcones Fault Zone Aquifer. The Edwards is discussed later in this letter in more detail and will be addressed in response to those specific comments.

The "apples to apples" comparison appears to relate to difficulty in judging the comparability of individual impacts listed in Table 2-12.

Based on your comment, impacts listed on Table 2-12, pages 2-42 through 2-45 of the Draft SEIS, have been clarified by complementing them with impact summaries for each discipline. A summary is provided of all significant impacts, listing the type of impact, magnitude of the impact, and other details required to describe that impact; please refer to Modifications and Corrections Section 3.4.

Hopefully, this may clarify some of your questions identified on page 2 in paragraph 1 of your letter where you criticize Table 3-1 relative to the information provided. In reference to your comment on Table 3-1, we assume you mean Table 2-12. This is not an impact table; this table summarizes the existing environment.

Again, we fully concur that this is the correct decision, and that the rationale is basically sound. But in light of the long and controversial history of this project, it is important that BLM not only make the correct decision, but that the reasoning and supporting data behind the decision be clearly stated and available to public scrutiny. Unfortunately, the technical and analytical portions of the document are full of what might be called "pseudo comparisons", primarily in the form of summary tables, such as Table 3-1, wherein a considerable amount of information and analysis regarding individual routes and their impacts are distilled into a single word. For example, for the topic, "ROW crosses areas sensitive to an oil spill," the answer for all three alternatives is: "Yes".

52-2 Cont.

The primary illustration of the need for a more credible comparison of alternatives is in the area of ground-water impacts. The agency's decision on the preferred alternative -- indeed, the entire EIS project -- centers on the fact that the applicant's original proposed alternative presented potential catastrophic impacts to the ground-water resource, and other alternative routes did not. The central issue, of course, is the extraordinary sensitivity of the Edwards Balcones Fault Zone Aquifer, in particular, and "aquifer sensitivity" in general. The DSEIS recognizes the importance of this issue quite explicitly, as it establishes several basic criteria for assessing relative sensitivity:

1. shallow water table or high vertical permeability (or both); and
2. sufficient water quality and quantity to support moderate to high degree of use.

These criteria could provide a framework for a simple but serviceable matrix analysis of relative sensitivity -- of the type recommended in the scoping process. But at this level of effort, the DSEIS analysis stops.

> In the event of an oil spill, significant impacts to ground water, surface water, aquatic biology, terrestrial biology, and land use and recreation could occur. These impacts would depend on the size and location of the spill; <u>therefore, it is not possible to quantify and compare potential oil spill impacts</u>. (Section 2.6, emphasis added)

LETTER 52

ESPEY, HUSTON & ASSOCIATES, INC.

52-2 Cont.

We submit that it is just this kind of quantitative comparison that the EIS process was initiated to develop, with respect to ground-water impacts at the very least. The problem, of course, is the absence of micro-level data on hydrogeological conditions along all three alternative alignments. To fully develop the analysis, an intensive field data collection effort along the lines suggested by Dr. Woodruff in his Scoping comments would have to have been completed. Such an effort is typically not prescribed for an EIS, but as should be apparent to even the most casual observer by now, All American Pipeline is not a typical EIS. It is, to my knowledge, the first pipeline EIS written for a Texas Project.

It is the absence of detailed, field-level hydrogeological data that has caused BLM to place such a heavy reliance on the worst-case analysis. This is entirely appropriate, as the worst-case mechanism was created, in essence, to deal with situations characterized by a "lack of credible scientific information". BLM has justified its preference for the northern alternative on a brief comparison of the worst-case or catastrophic impact scenarios variously presented by the three alignments. For the applicant's proposed route, it is a large line break near Onion Creek or a highly transmissive upland zone, especially during a heavy rain. For the southern alternative, problems inherent in its much greater length and slope instabilities are compounded by the relative remoteness of the alignment, causing anticipated spill response time and hence "largest credible spill" estimates to increase accordingly. Along the northern route, BLM associates the greatest probability for a catastrophic event with the proximity of numerous river crossings to downstream municipal water supply reservoirs. Of the three, only the surface water scenario of the northern route lends itself to a credible mitigation response; hence, the selection of the northern route.

LETTER 52

ESPEY, HUSTON & ASSOCIATES, INC.

52-2 Cont.

While we have no problem with the conceptual basis for this approach, there are several points in the description in Appendix C, "Onion Creek to Edwards Aquifer Oil Spill Scenario", that should be corrected or clarified. These points are presented in a subsequent section of these comments.

In conclusion, I would like to repeat our appreciation of the effort expended in producing this document and our full support of its finding that the northern alternative is the least environmentally damaging feasible alternative. The preceding comments, and those that follow, are intended to assist BLM and its consultant in clarifying, improving, and adding substance to the underlying analyses and interpretations that led to that finding. In this way, the agency will gain even greater confidence in its confirmation of the preferred alternative in the Record of Decision at the conclusion of the EIS process.

RESPONSE TO LETTER

LETTER 52

ESPEY, HUSTON & ASSOCIATES, INC.

II. AQUATIC ECOLOGY

GENERAL COMMENTS

52-3 There are several fundamental faults with the treatment of aquatic ecology impacts in this document, and numerous minor ones. For example, there is only minimal explanation (p. 2-34) for the selection of the three routes (proposed, northern and southern) and no information at all on corridor size. Selection of these routes should be accompanied by supporting data to allow the reader to evaluate first the choices and secondly the reasoning behind the choices.

Another major fault is that there is inadequate comparison of the three routes. The only direct comparison of aquatic biology, found in Table 2-12 (p. 2-43), is neither accurate nor complete and is inconsistent with the text. Although detailed information is given in the text for each route, much of it is repetitious, leaving the reader to wade through unnecessary pages in addition to having to make his or her own comparisons. A much more practical presentation would be to describe the proposed route in detail and then to discuss why the two alternatives are better or worse than the proposed route.

52-4 In the treatment of rare, threatened, and endangered aquatic species, no mention is made of listings by the Texas Organization for Endangered Species (TOES), standard practice in EIS's prepared for proposed projects in Texas. Neither is there any reference to listings by the Texas Natural Heritage Program (TNHP), and although such listings need not be discussed in the text, they certainly warrant appearing in a table. Changes to the state list proposed by the Texas Parks and Wildlife Department (TPWD) and available to the public since at least June, 1986, are not mentioned; those changes are now final (12 Tex. Reg. 464), thus making the discussion on state-listed species out-of-date.

RESPONSE TO LETTER 52

52-3 Your comment regarding the comparison of the three routes is noted. The analysis of alternative routes was based on evaluation of the engineering feasibility and environmental impacts for four routes across the state. AAPL initially modified these routes to reduce environmental impacts using their own environmental consultants. Three of those routes, the Proposed Route, Northern Alternative, and Southern Alternative, were selected by BLM for analysis in the SEIS. These routes were further modified by the BLM to avoid potentially significant environmental impacts, such as the alignments that passed through the proposed Stacy Reservoir near San Angelo, Texas and the two proposed Cuero Reservoirs near Yoakum, Texas. Each alignment has been further modified by location, construction or operation techniques, or mitigation measures to reduce significant impacts to acceptable levels.

The information used in Table 2-12 (page 2-43) to compare significant impacts and concerns for aquatic biology resources associated with the three routes was derived from Chapter 3 in the Draft SEIS. The table is considered complete and consistent with the Chapter 3 text. Since no examples of incomplete or inconsistent information are provided in the comment, it is not possible to evaluate possible errors in Table 2-12. To aid in comparing impacts for the three routes, a summary is provided for each route in Section 3.4 of the Modifications and Corrections section.

The format presented in the Draft SEIS is one commonly used by the BLM and is consistent with the CEQ guidelines which stress the evaluation and comparison of alternatives. Chapters 3 and 4 in the Draft SEIS are both organized to provide complete discussions for each alternative rather than to group all discussions for each discipline in one location. The BLM believes the organization used in the Draft SEIS better enables the reader to evaluate each alternative for all disciplines.

52-4 The TOES listing has no legal basis and was not included in the significance criteria as an independent list. TPWD's amended species list (March 1, 1987) was obtained and reviewed. The status of applicable species were updated and are presented in the Modifications and Corrections section for Tables 3-14, 3-14a, 3-47, 3-47a, 3-66, and 3-66a. Please refer to the response to Comment 52-9.

LETTER 52

ESPEY, HUSTON & ASSOCIATES, INC.

SPECIFIC COMMENTS

52-5 There are problems with the distribution of some of the species listed in Tables E1-1, E1-4 and E1-5. Although there is some attempt to tabulate the species for each route, the tables are largely a species list for the river in general and hence often inaccurate and inappropriate. The northern, middle and lower reaches of the rivers will have some differences, for coastal species will not be found in north Texas, and species clearly restricted to headwaters will not be found in south Texas. The list should be restricted to each pipeline crossing and not be so general.

52-6 The paragraph on p. 4-54 dealing with the results of a major oil spill along the proposed route is inadequate. It is too general and there are no data or literature citations to support the concluding sentence. In addition, the choice of striped bass as being the most sensitive freshwater fish to toxicity in eleven streams, is a poor one; striped bass are largely introduced inhabitats of reservoirs in Texas. In this same paragraph Table 4-17 should be Table 4-16.

52-7 In addition to the example in the preceding paragraph, there are numerous other key statements which are not substantiated by data, references to other sections or literature citations. There are also several incorrect assumptions. In Table 4-15, for example, there is an assumption that the rivers normally contain high flows. This is incorrect; many of them are flashy rivers, with periods of extended low flow.

In several instances there are incongruities and even contradictory statements. In Table E1-3, the sand seatrout appears to be going in opposite directions at the same time, both into and away from the Gulf during spring and summer.

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52-5 Your comment concerning the listing of fish species for the three routes is noted. In most instances, fish distribution information is not available for specific sections of the rivers below the proposed pipeline crossings. Therefore, the lists were developed using geographical distributional studies (e.g., Hubbs 1981) and TPWD reservoir and river surveys. It is important to understand that the study area for a particular river crossing would extend from the crossing to the coast, if there is no downstream reservoir. For this reason, coastal fish species are included for rivers associated with each route. We agree that headwater fish species should not be included in rivers associated with the Proposed Route and Southern Alternative. Please refer to the Modifications and Corrections section for revisions to Tables E1-1, E1-4, and E1-5.

52-6 The comment regarding the impact discussion of oil spills on aquatic resources for the Proposed Route was reviewed. Some of the information presented in paragraph 4, page 4-54 in the Draft SEIS is general because site-specific data on oil toxicities and the behavior of oil in the streams are not available. Literature citations for the concluding sentence are provided in the Modifications and Corrections section for page 4-54. The selection of striped bass as a sensitive species is warranted because the species occurs in Lake Travis and the Colorado and Brazos Rivers. Of the other important species occurring in rivers and downstream reservoirs (Table 4-15) with oil toxicity information (Table 4-16), the sunfish family would be moderately sensitive. The reference to Table 4-17 should be Table 4-16; see the Modifications and Corrections section for page 4-54.

52-7 Your comment concerning the lack of substantiation for other key statements with literature citations or reference to other sections is noted. Without specific examples of statements needing documentation, it is not possible to provide the information. Whenever possible, literature citations and reference to other sections were used. In response to the comment on Table 4-15, there was no assumption that the rivers listed contain "high flows". The statement on page 4-54, paragraph 4 (lines 7 to 10), which references Table 4-15, considered the Pedernales, Colorado, and Brazos Rivers as rivers with "...high flows, large volumes..." This statement is modified slightly; see the Modifications and Corrections section for page 4-54. The comment concerning sand seatrout movements in Table E1-3 was reviewed. The movements, although in opposite directions, are for two different life stages (juveniles and adults). This is a common characteristic for some marine fish species. The tables in Appendix E were reviewed for possible errors; please refer to the Modifications and Corrections section for corrections to Tables E1-1 through E1-7.

Please see the response to Comment 52-3 for a discussion of the selection of alternative routes and the response to Comment 52-2 for a discussion of the comparison of alternatives.

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52-7 Cont.

There are numerous typographical errors, especially in the tables. Many scientific names of fish species were misspelled.

In summary, the most critical flaw remains the justification of the route selection for each alternative. No discussion is provided which delineates the process by which the route was selected and how impacts along each route were assessed or avoided. Of equal importance is the poor comparison of the three routes with regard to impact assessment.

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III. TERRESTRIAL ECOLOGY

GENERAL COMMENTS

52-8 The most serious fault with this document is in its organization, or format. The treatment of each alternative route in different subsections in the Affected Environment and Environmental Consequences sections does not help the reader to make a comparison of the three routes. Information is there for the reader to glean from separate sections, but it is not compiled in one place. The only direct comparison of terrestrial ecology is found in Table 2-12 (p. 2-43), and this is neither accurate nor complete. NEPA regulations (40 CFR Parts 1500-1508) are very clear on this issue:

> **Sec. 1502.14 Alternatives including the proposed action.**
> This section is the heart of the environmental impact statement. Based on the information and analysis presented in the sections on the Affected Environment (Sec. 1502.15) and the Environmental Consequences (Sec. 1502.16), it should present the environmental impacts of the proposal and the alternatives in comparative form (emphasis added), thus sharply defining the the issues and providing a clear basis for choice among options by the decisionmaker and the public.

The organization of the DSEIS does not allow such a comparison.

52-9 The analysis of rare, threatened, and endangered (RTE) terrestrial species fails in several respects. No mention is made of species listings by the Texas Organization for Endangered Species (TOES), standard in EIS's prepared for proposed projects in Texas. Animals listed by the Texas Natural Heritage Program (TNHP) are not discussed as they are listed by that agency. As in the aquatic ecology section, changes proposed by the Texas Parks and Wildlife Dept. (TPWD) to the state list in December 1985 are not discussed; those changes are now final (12 Tex. Reg. 464), thus making the discussion on state-listed species out-of-date. If

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52-8 Table 2-12 has been expanded to enhance its use in comparing alternatives. Section 1502.14 of the NEPA regulations applies only to the Alternatives chapter; as written, the affected environment and environmental consequences chapters fully conform to the intent of the regulations. Section 1502.15 requires only that the Environmental Consequences chapter provide "the scientific and analytical basis for the comparisons" made in the Alternatives chapter. BLM prefers a format which allows each alternative to stand alone. We believe this format is more useful to the decision maker and more understandable to the general reader interested in the whole range of impacts of a project on a given region.

52-9 The TOES list has no legal status and was not included in the significance criteria for terrestrial or aquatic ecology.

According to your list, 30 species listed by TNHP were not addressed in the Draft SEIS. We asked TNHP to provide all Texas listed species, including their own list, occurring in a 10-mile wide corridor along each of the pipeline routes. These 30 species were not included on TNHP's list because they would not be impacted by the pipeline.

The TPWD list used for the Draft SEIS preparation in September 1986 was the most current (official) list. We realized a new list was being considered in the Texas legislature. According to your letter, only five additional species are listed that were not evaluated in the Draft SEIS. TNHP information to date concerning these five species is summarized in the Modifications and Corrections for Table 3-14a.

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52-10 the state-proposed changes had been discussed in the DSEIS, revision of the Final SEIS to reflect those changes would have been greatly facilitated. Only the species listings of the U.S. Fish and Wildlife Service (FWS) are given adequate treatment regarding status; however, in some instances, these species are discussed inaccurately in the context of one or more alternative routes. Nowhere in the DSEIS, including Appendix E, is there a thorough, adequate comparison of RTE species and impacts for the alternative routes. Such a comparison is necessary to allow the reader to evaluate the alternative routes.

52-11 Table 1 lists RTE amphibians, reptiles, birds, and mammals within the area of the three alternatives. All species listed by TOES, TNHP, TPWD, and FWS of potential occurrence in the surrounding and downstream areas are shown. Listings are current as of 1 March 1987. Eight-three species share an equal potential to occur along or downstream of any of the alternative routes. The proposed route coincides with the distribution of an additional 23 species, plus 3 species at the edge of their range in areas potentially affected by that route, for a total of 109 species. The northern and southern alternatives overlap the ranges of an additional 7 and 19 species, and are peripheral to 2 and 7 species, for a total of 92 and 109 species, respectively.

Appendix E contains absolutely no discussion of plants or communities, including RTE species and communities. Again, there is no comparison of alternatives, either in Appendix E or the main document.

52-12 There is only minimal explanation given for the selection of the route alignments. On page 2-34 of the DSEIS is a very brief description of the selection criteria. This is inadequate as a basis for the reader to determine that alternatives were chosen which would minimize impacts. If other documents have been prepared which discuss the selection process in greater detail, then those should be incorporated by reference.

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52-10 All federal species are discussed accurately based on input by USFWS, TPWD, TNHP, and other experts. Revised Table 2-12 in Modifications and Corrections Section 3.2 provides a cumulative comparison of impacts to important wildlife species between the three routes.

52-11 Please refer to the response to Comment 52-9 concerning applicable threatened, endangered, and special status species.

Appendix E is a detailed discussion (expansion) of threatened or endangered wildlife sections for each route (baseline conditions). It was not meant to include plants which were adequately described in the main text of the Draft SEIS.

52-12 Please see the response to Comment 52-3 regarding the selection of route alignments.

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52-13 A very minimal effort went into developing the baseline information. Field surveys, ground truthing, and evaluation of river and creek crossings (and other sensitive areas) seem to have been performed in a very cursory manner.

52-14 Greater emphasis should be placed on those species and ecosystems which would be in greatest danger if a spill occurred (e.g., subterranean aquatic animals and ecosystems in the Edwards Aquifer) than on those that would possibly be affected during construction (e.g., Bald Eagle and Attwater's Greater Prairie-Chicken, although both of these federally-endangered birds are a major consideration).

Wetlands are not quantified for the alternative routes. As a sensitive habitat, this type should be included in Tables 3-10, 3-44, and 3-63. Quality and characteristics of wetlands should be discussed in the text.

Inadequate attention is given to rare endemic taxa of the Edwards Plateau, and the unique canyon, cave, sinkhole, and rimrock habitats found in this region. This is especially important as it pertains to the Proposed Route.

SPECIFIC COMMENTS

52-15 Numerous key statements are not substantiated in the report, either by reference to other sections or literature citations. In several instances, literature is cited in the text that is not included in the bibliography, for example: Johnson and Horne, 1986; Kinako, 1986; Hutchinson et al., 1984; Schwendinger, 1968; Gran et al., 1979; Nelson-Smith, 1972; Vangilder and Peterie, 1980; Rattner, 1981; Hartung, 1965; Macko and King, 1980; Albers, 1980; Hoffman, 1979; Tennant, 1984; and Szaro, 1979. This list could probably be extended by checking other references in the text, as the only references I found that were in the bibliography were personal communications.

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52-13 Extensive interviews were conducted with species experts and agency personnel in obtaining lists of species and their known or expected occurrence along pipeline routes. Field surveys are being conducted (estimated completion date, September 1987) where federally endangered species are still of concern. Species surveyed include the Houston toad, Concho water snake, bald eagle, Attwater's greater prairie chicken, black-capped vireo, Tobusch fishook cactus, and Texas snowbells.

Field reconnaissance was conducted for each of the pipeline routes with emphasis on sensitive resources. Brief summaries of the aerial and ground surveys, dates, and personnel are presented below. The personnel qualifications are included in the List of Preparers, Section L, of the Draft SEIS.

6/24/86 - 6/28/86 — Aerial survey of Proposed Route from McCamey to Webster and ground survey of route at road crossings.
- Phil Hackney - Terrestrial Ecology and Soils
- Scott Duncan - Terrestrial Ecology
- Mark Zuber - Water Resources and Geology
- Bernie Strom - Visual Resources and Land Use (aerial survey and spot survey of eastern end of route)

6/30/86 - 7/3/86 — Ground survey of major stream crossings along Proposed Route from McCamey to Webster
- Ron Sutton - Aquatic Ecology

8/4/86 - 8/11/86 — Aerial survey of Northern Alternative from McCamey to Webster and Texas City and ground survey of route at road crossings.
- Phil Hackney - Terrestrial Ecology and Soils
- Ron Sutton - Aquatic Ecology
- Bob Sanz - Terrestrial Ecology
- Mark Zuber - Groundwater and Geology
- Greg Groene - Surface Hydrology (ground survey only; field reconnaissance of stream crossings)
- Bernie Strom - Visual Resources and Land Use (aerial survey only)

8/21/86 - 8/24/86 — Aerial survey of Southern Alternative from McCamey to Webster and Texas City and ground survey from west of Uvalde to San Antonio.
- Phil Hackney - Terrestrial Ecology and Soils
- Mark Zuber - Groundwater and Geology
- Greg Groene - Surface Hydrology (aerial survey only)

8/25/86 - 8/28/86 — Ground survey of the Southern Alternative including the following stream crossings:

Onion Creek, San Bernard River, Navidad River, Colorado River, Lavaca River, Cibolo Creek, Guadalupe River, San Antonio River, Hondo Creek, Sabinal Creek, Frio River, and Nueces River.
- Bob Sanz - Terrestrial Ecology
- Rollin Daggett - Aquatic Ecology

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52-15 Cont. Gould (1962) is included in the bibliography; however, this publication has been revised twice (1969 and 1975).

52-16 The heading of "Status (Federal/State)" in Tables 3-13, 3-46, and 3-65 should be changed to "Status (Federal/TNHP)" to more accurately reflect the agency under which those elements are listed.

52-17 Potential impacts on Matagorda and San Antonio Bays should be considered in greater detail. Section 3.2.7.3.2 (p. 3-55) states that it is "highly unlikely oil could reach these waters" without referring to the source of that conclusion. If such impacts do not warrant consideration in the terrestrial ecology sections, why are they given full treatment in the section on aquatic biology (Section 4.2.6.3, p. 4-52, and Table 4-18, p. 4-58)?

52-18 Rare, threatened, and endangered species were evaluated in the report based on several sources (listed on p. 3-55). The TOES list was not included as a source, although it is generally very useful in this regard. As stated above, the listings of this organization should have been considered in the DSEIS.

The Louisiana black bear is not at the periphery of its range in Texas, contrary to the statement on p. 3-61. This subspecies was formerly common throughout east Texas, but is now extirpated. Bear sightings reported in Texas (excluding the Trans-Pecos region) are Ursus americanus americanus, a subspecies which has been restocked into Arkansas and Louisiana from Minnesota (Nowak, pers. comm.).

The Black-capped Vireo was proposed by FWS on 12 December 1986 for listing as endangered (51 FR 44808). The status of this bird is shown as Category 1 in all text and tables where it appears; these should be corrected to show the proposed status.

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12/18/86 - 12/20/86 Field reconnaissance of pump stations with sensitive noise receptors for the Proposed Route, Northern Alternative, and Southern Alternative. Ground survey of sensitive visual resources along Proposed Route.
Bernie Strom - Visual Resources and Noise

52-14 We believe all state and federal species were evaluated that occur in the Edwards Aquifer region. Little is known of species living in subterranean habitats of the aquifer, and even less is known of potential impacts from spills by the pipeline project. The data presented in the Draft SEIS and Biological Assessment were the best available. The revised catastrophic oil spill scenario (Appendix B of the Final SEIS) portrays how a large quantity of oil could enter the aquifer. For soluble fractions of oil to get to San Marcos Springs and San Marcos River, the fractions must pass under Blanco Creek and flow over 12 miles underground in total. No models exist to predict dispersion, in fact no known case of groundwater contamination by crude oil of this magnitude has ever been demonstrated. The severity of the impact is impossible to predict and the probability of the event would be rare.

The impacts to wetlands associated with the alternatives are discussed on pages 4-125 and 4-126 for the Northern Alternative and pages 4-157 and 4-159 for the Southern Alternative. Revised Table 2-12 in the Modifications and Corrections section compares the wetlands impacts for all three routes.

52-15 Please refer to the References section in the Final SEIS for additional references.

52-16 Please refer to Modifications and Corrections section for pages 3-53, 3-142, and 3-206. The headings on these tables have been revised.

52-17 The long transport times for spilled crude oil from pipeline crossings of major rivers to Matagorda and San Antonio Bays (26.5 hours and 20.0 hours, respectively), during a major spring storm event, should allow adequate time for oil containment prior to impacting these sensitive areas. Galveston Bay was evaluated in greater detail due to shorter transport times which could be as little as 2.5 hours during high storm potential.

52-18 Please refer to the response to Comment 52-9 concerning the TOES listings. Your comment on the Louisiana black bear (Ursus americanus luteolus) has been noted and changed to black bear (Ursus americanus americanus). The black-capped vireo's status has also been changed to proposed federally endangered. Your comment on the Texas Henslow's sparrow has been noted and its current state status clarified.

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52-18 Cont. In reference to comments on p. 3-61 regarding the Texas Henslow's Sparrow, it should be noted that this is not an extinct species. Arnold (Status Report, 8 August 1984, FWS, Albuquerque) noted that this subspecies is highly likely to be extinct in Texas (i.e., extirpated from the state).

52-19 Section 3.3.7 (beginning on p. 3-134) does not inlcude any discussion of waterfowl species or habitats along the Northern Alternative.

52-20 Section 3.3.7.3.1 (p. 3-140) states that "no state threatened or endangered plant species are present within this (northern route) area." The state does not officially list threatened or endangered plants independently, but only recognizes the federal list.

"The exposed rocky outcrops and various microclimates" cited on p. 3-202 (Section 3.4.7.2) as being different on the Southern Route from the Proposed Route or Northern Alternative, should be better identified. This statement should be substantiated. What wildlife species are unique or different in these habitats along the Southern Route? Such habitats are more unique in the area of the Proposed Route.

Table 3-64 (p. 3-205) does not list rare animal species, as stated in the first paragraph in Section 3.4.7.3 on p. 3-204.

A comparison can be easily made regarding RTE plants and communities within the regions of the three alternatives, as shown in Table 2. Such a comparison should be included in the EIS, to better enable the reader to evaluate the alternative routes.

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52-19 Your comment on waterfowl is noted. Waterfowl species and habitats encountered along the Northern Alternative are similar to that presented for the proposed route. See Modifications and Corrections section for page 3-139.

52-20 Your comment regarding state-listed and federal-listed plant species is noted.

Our reference to the exposed rocky outcrops along the Southern Alternative was to point out one area of difference between the Southern Alternative, the Proposed Route, and the Northern Alternative in the Edwards Plateau. We feel that it is important to note that a portion of the Southern Alternative is characterized by rough, broken topography and steep slopes. There are not necessarily unique or different wildlife species associated with these habitats.

Your comment regarding reference to Table 3-64 is noted. The first paragraph in Section 3.4.7.3 is referring to special status plants on Table 3-64. Please see also the Modifications and Corrections section for page 3-204 for clarification.

The comparison regarding special status plant species was made between alternatives for significant impacts (see Table 2-12). A comparison of baseline information was not warranted.

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52-20 Cont.

Table 2. Sensitive plant species and communities within route regions (from Table 3-12 (p. 3-51), Table 3-45 (p. 3-141), and Table 3-64 (p. 3-205))

Route	Number of Species						
	Fed. Endangered	C2	3C	TNHP-S1	TNHP-S2	Communities	Total*
Proposed	3	7	7	6	13	5	24
Northern	0	3	5	0	9	3	12
Southern	1	2	4	4	7	1	12

* Elements listed federally and by TNHP are only counted once.

52-21 Section 4.2.7.3.1 (Threatened and Endangered Species), beginning on p. 4-66 discusses three federally listed species: Texas wild rice, San Marcos salamander, and Texas blind salamander. Section 4.2.6.3 (beginning on p. 4-52) discusses the San Marcos gambusia and fountain darter, two additional federally-endangered species. Neither section, nor any other section in the document, fully addresses the uniqueness of the Edwards Aquifer ecosystem. This ecosystem is globally ranked as one of the most intricate aquifer ecosystems (Longley, pers. comm.). As such, it deserves separate discussion.

52-22 Table E2-5 (Appendix E, p. E2-29) lists acres of habitat for the Golden-cheeked Warbler by county for all three alternative routes. This species is not known to occur in Val Verde County (Pulich, 1976, The Golden-cheeked Warbler: a bioecological study, TPWD, 172 pp.). Parrot (1974, Special report, project W-103-R: Golden-cheeked Warbler habitat and distribution survey, TPWD, 16 pp.) reported the range of this species. It is evident from comparing the range of the species and the Southern Route that this alternative would avoid Golden-cheeked Warbler impacts. Furthermore, habitat conditions in the area of the Southern Route through these

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52-21 Please refer to the response to Comment 52-14.

52-22 The golden-cheeked warbler is state threatened and a federal candidate - category 2 species. The primary habitat for this species is north of the Southern Alternative; however, potential warbler habitat, though poor, may occur in remote sections of this route. The TPWD also lists the golden-cheeked warbler as being a possible species of occurrence for Val Verde County and a confirmed species for Edwards, Kinney, Uvalde, Medina, Atascosa, Bexar, and Wilson Counties, according to their Endangered/Threatened Species Data File - April 20, 1987. In addition, Table E2-5 represents potential habitat by route, not actual habitat occupied.

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52-22 Cont. counties is nowhere suitable for the warbler (pers. obs.). Therefore, the Southern Alternative may be regarded as having only a remote possibility of affecting this species.

52-23 Mitigation measure TB-7 (p. 4-185) states that this measure will be applied "in those counties identified in the SEIS as being particularly susceptible to oak wilt disease." No counties are identified in the DSEIS as being susceptible, therefore, this measure is meaningless. Appel et al. (1985. An extended range for oak wilt and Ceratocystis fagacearum compatibility types in the United States. Can. J. Bot. 63:1325-1328.) described the county distribution of oak wilt in Texas. It is recommended that mitigation measure TB-7 be applied in the counties identified in that paper.

52-24 No mitigation measures are offered in Section 4.7.7 (p. 4-183) designed to protect the Edwards Aquifer ecosystem or species in the event of a spill. Specific mitigation measures should be included to protect that aquifer ecosystem and the particular species which inhabit it.

52-25 Table 4-64 (p. 4-204) lists the Concho water snake as "federal endangered." This should be corrected to read "federal threatened."

52-26 Appendix E, Tables E2-2, E2-6, and E2-7 (pgs. E2-17, E2-30, and E2-38) state that the Kemp's Ridley and loggerhead do not occur in Galveston Bay. This is false. Five head-started Kemp's Ridleys have been caught in Galveston Bay since 1978 (Manzella, pers. comm.). In 1986, four wild Kemp's Ridleys were stranded in the Galveston Bay system (Duronslet, pers. comm.). Loggerheads are known to occur in Galveston Bay (Sea Turtle Stranding and Salvage Network (Texas) 1985).

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52-23 Thank you for your comment. Counties with known or potential oak wilt disease concerns were identified in the Draft SEIS on pages 3-46, 3-138, and 3-202 for the Proposed, Northern, and Southern Alternatives, respectively. Please refer to revised Mitigation Measure TB-7 which now includes a listing of counties susceptible to oak wilt.

52-24 Please refer to the project description on pages 2-27 through 2-30 of the Draft SEIS for the special design features associated with the Edwards and Ellenberger Aquifers. Please also refer to Mitigation Measure SS-7 in Appendix A of the Final SEIS.

52-25 Table 4-64 has been corrected as noted in the Modifications and Corrections section.

52-26 This table states adult Ridleys do not occur in Galveston Bay, which they normally do not, except for the very rare straggler. Therefore, we acknowledge and have stated juvenile Ridleys have been reported in the Galveston Bay.

The statement regarding the data by Duronslet was not in our study. The statement in the Draft SEIS was correct based on the stranding data provided by Schroeder (1986) in Table E2-2. It may be true that a few adult Ridleys (we assume you mean adults) occur in Galveston Bay, but the number must be very small since most strandings are on the ocean side of barrier islands. The chance of oil spill impacts to any of the few adults in Galveston Bay is extremely remote.

The similar argument pertains to loggerheads in Galveston Bay. Based on communication with species experts, the chances of loggerheads in the Galveston Bay is remote, as they generally migrate further off shore. Individuals could wander into the bay, but due to the small species number predicted to occur, potential oil spill impacts are not likely. The current risks to Ridley or loggerhead turtles will not be increased by the proposed project over the current risks from the shipping and petrochemical oil industry.

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IV. GEOLOGY/GROUND WATER

52-27 Apart from the general comment, previously stated, that the document fails to provide an adequate comparison of impacts among the three alternatives, the treatment of geology/ground-water impacts is, for the most part, adequate. The following provides a few comments where additional investigation or discussion may be warranted.

52-28 Sections 3.2.4.6, 3.3.4.6, 3.4.4.2 as well as 4.2.4.3.5 discuss karstic terrain. Although not karstic, sinkhole development is not uncommon in the Texas coastal plain or in west Texas where oil field activities have triggered the creation or collapse of sizable sinkholes (Boling Sinkhole near Wharton and Wink sinkhole near Wink are two examples). Little attention is paid in the DSEIS to this potential.

52-29 A more detailed discussion of the cathodic protection system is needed. Are there potential chemical impacts from anode disintegration? How will those effects be monitored? More detailed abandonment plans are needed.

52-30 In discussion of case studies (Section 4.2.1.3.3), the Shell pipeline spill is glossed over rather lightly. At p. 4-23, it is stated, "... damage to the environment was limited", but actual and long term damage is still being investigated by the City of Austin and Radian Corporation. Hydrocarbon vapors were noted in caves as far away as 2 miles. This indicates the potential for significant impact.

52-31 The discussion in Appendix C of the spill event scenario is somewhat superficial and difficult to follow. There is a noticeable lack of description as to how specific volumes, flow rates, or hydrocarbon concentrations were derived. For example, on p. C-4, how does one get from 1298 barrels in the swale to 806 barrels reaching Onion Creek? The next paragraph states that the 806 barrels will saturate the six mile reach over the recharge zone to 50 mg/l and still leave 780 barrels; this

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52-27 Please refer to the response to Comment 52-2 regarding the comparison of impacts.

Please also refer to the impacts summary sections for the three routes in Section 3.4 of Modifications and Corrections.

52-28 Please refer to the response to Comment 68-39.

52-29 The Cathodic protection system and the proposed abandonment plans meet applicable regulatory standards.

52-30 Please refer to the response to Comment 33-3 regarding the status of studies of the Shell Pipeline oil spill.

52-31 The Onion Creek to Edwards Aquifer oil spill scenario has been revised; please refer to Appendix B of the Final SEIS.

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implies that 26 barrels will saturate 2.439×10^6 ft^3 to 50 mg/l, a questionable result requiring better documentation.

52-31 Cont.

Another example occurs in the fourth paragraph, third sentence: "At this rate ... 4.281×10^8 mg of dissolved crude has been introduced to the Edwards Aquifer." Unfortunately, there is no reference to how long it takes to reach this condition. The only mention of time is in an earlier paragraph with respect to how long it took the spill prevention team to arrive (two and one-half hours).In paragraph six, it is hypothesized that 46% of spilled crude discharges into Onion Creek. What is the basis for selecting 46%? All in all, this analysis assumes that only crude dissolved constituents in surface water will enter the aquifer, resulting in .035 mg/l concentration of crude in the ground water. What basis is there for eliminating the possibility that the crude itself might enter the unsaturated portion of the formation (maybe even reaching the saturated portion, or water table, by percolation) and then dissolve out into the ground water?

The surface water portion of Appendix C is poorly documented. More discussion of the SCS graphical method is needed, particularly as to what assumptions were used in arriving at the various discharges. This is made even more important since the concentration or amount of crude entering the aquifer in this analysis is directly related to the volume of discharge.

LETTER 52 (CONTINUED)

Table 1. Rare, threatened, and endangered amphibians, reptiles, birds, and mammals of potential occurrence within the areas of the All-American Pipeline alternative routes.

Com. name	Sci. name	TOES	TNHP	TPWD	USFWS	Route		
Cascade Caverns Salamander	Eurycea latitans	T	NL	T	Cat. 3B	(P)		
San Marcos Salamander	Eurycea nana	T	G1/S1	T	T	P		
Texas Salamander	Eurycea neotenes	NL	G3/S3	NL	Cat. 2	P	N	S
Comal Blind Salamander	Eurycea tridentifera	T	G1/S1S2	T	Cat. 2			S
Valdina Farms Salamander	Eurycea troglodytes	T	NL	NL	Cat. 3B			S
Barton Springs Salamander	Eurycea sp.	NL	G1/S1	NL	Cat. 2	P		
Black-spotted Newt	Notophthalmus meridionalis	NL	G1/S1	E	Cat. 2			(S)
Whitethroat Slimy Salamander	Plethodon glutinosus albagula	NL	G5T3/S3	NL	NL	P	N	S
Rio Grande Lesser Siren	Siren intermedia texana	T	G5T2/S2	E	Cat. 2			(S)
Texas Blind Salamander	Typhlomolge rathbuni	T	G1/S1	E	E	P		
Blanco Blind Salamander	Typhlomolge robusta	T	G1/S1	E	Cat. 2	P		
Houston Toad	Bufo houstonensis	E	G1/S1	E	E	P	N	
Barking Frog	Hylactophryne augusti	NL	G4/S3	NL	NL	P		S
Rio Grande Chirping Frog	Syrrhophus cystignathoides campi	NL	G5/S3	NL	NL	P	N	S
Cliff Chirping Frog	Syrrhophus marnockii	NL	G4/S4	NL	NL	P	N	S
Loggerhead	Caretta caretta	T	G3/S2	E	T	P	N	S
Green Turtle	Chelonia mydas	T	G3/S1	T ssp.	T	P	N	S
Leatherback	Dermochelys coriacea	E	G3/S1	E	E	P	N	S
Hawksbill	Eretmochelys imbricata	E	G3?/S1	E	E	P	N	S
Texas Tortoise	Gopherus berlandieri	T	G4/S3	T	NL			S
Cagle's Map Turtle	Graptemys caglei	NL	G3/S3	NL	Cat. 2	P		(S)
Texas Map Turtle	Graptemys versa	NL	G4/S4	NL	Cat. 2	P	N	
Kemp's Ridley	Lepidochelys kempi	E	G1/S1	E	E	P	N	S
Alligator Snapping Turtle	Macroclemys temminckii	NL	G5/S3	T	Cat. 2	(P)	(N)	(S)
Texas Diamondback Terrapin	Malaclemys terrapin littoralis	T	G5T3/S3	NL	NL	P	N	S
American alligator	Alligator mississippiensis	T	NL	NL	T/SA	P	N	S
Trans-Pecos Striped Whiptail	Cnemidophorus inornatus heptagrammus	NL	G5T4/S4	NL	NL	P	N	S
Reticulate Collared Lizard	Crotaphytus reticulatus	T	G3/S2	T	Cat. 2			S
Texas Horned Lizard	Phrynosoma cornutum	T	G5/S5	T	NL	P	N	S
Trans-Pecos Copperhead	Agkistrodon contortrix pictigaster	T	NL	NL	NL	P	N	S
Timber Rattlesnake	Crotalus horridus	NL	NL	T	NL	P	N	S
Mottled Rock Rattlesnake	Crotalus lepidus lepidus	T	NL	NL	NL	P	(N)	S
Texas Indigo Snake	Drymarchon corais erebennus	NL	NL	T	NL			S

Table 1, Continued.

Com. name	Sci. name	TOES	TNHP	TPWD	USFWS	Route		
Baird's Rat Snake	Elaphe bairdi	T	G4/S4	NL	NL	P	N	S
Trans-Pecos Rat Snake	Elaphe subocularis	NL	NL	NL	NL	P		S
Desert Kingsnake	Lampropeltis getulus splendida	NL	NL	NL	Cat. 3C	P	N	S
Gray-banded Kingsnake	Lampropeltis mexicana alterna	T	NL	NL	Cat. 3C	P	N	S
Lousiana Milk Snake	Lampropeltis triangulum amaura	T	NL	NL	NL	P	N	S
Mexican Milk Snake	Lampropeltis triangulum annulata	T	NL	NL	NL	P	N	S
Gulf Saltmarsh Snake	Nerodia fasciata clarkii	NL	G5T4/S3	NL	NL	P	N	S
Concho Water Snake	Nerodia harteri paucimaculata	E	G1T1/S1	E	T		N	
Least Grebe	Tachybaptus dominicus	NL	G5/S3	NL	NL	P	N	S
Brown Pelican	Pelecanus occidentalis	E	G5/S1	E	E	P	N	S
Reddish Egret	Egretta rufescens	NL	G4/S2	T	Cat. 2	P	N	S
White-faced Ibis	Plegadis chihi	T	NL	T	NL	P	N	S
Roseate Spoonbill	Ajaia ajaja	NL	G5/S4	NL	NL	P	N	S
Wood Stork	Mycteria americana	NL	NL	T	NL	P	N	S
Fulvous Whistling-duck	Dendrocygna bicolor	T	NL	NL	NL	P	N	S
Masked Duck	Oxyura dominica	NL	G4/S4	NL	NL	P		
Osprey	Pandion haliaetus	NL	G5/S3	NL	NL	P	N	S
American Swallow-tailed Kite	Elanoides forficatus	T	G5/S2	T	Cat. 2 ssp.	P	N	S
Bald Eagle	Haliaeetus leucocephalus	E	G3/S2	E	E	P	N	S
Common Black-Hawk	Buteogallus anthracinus	T	G5/S2	T	NL			S
Swainson's Hawk	Buteo swainsoni	NL	NL	NL	Cat. 2	P	N	S
White-tailed Hawk	Buteo albicaudatus	T	G5/S2	T	NL	P	N	S
Zone-tailed Hawk	Buteo albonotatus	T	G5/S3	T	NL	P	N	S
Ferruginous Hawk	Buteo regalis	NL	G4/S3	NL	Cat. 2	P	N	S
Golden Eagle	Aquila chrysaetos	T	NL	NL	NL	P	N	S
Merlin	Falco columbarius	T	NL	NL	NL	P	N	S
Northern Aplomado Falcon	Falco femoralis septentrionalis	NL	G4/SX	E	E			(S)
American Peregrine Falcon	Falco peregrinus anatum	E	G3/S1	E	E	P	N	S
Arctic Peregrine Falcon	Falco peregrinus tundrius	E	G3/S1	T	T	P	N	S
Prairie Falcon	Falco mexicanus	T	NL	NL	NL	P	N	S
Attwater's Greater Prairie-Chicken	Tympanuchus cupido attwateri	E	G4T1/S1	E	E	P	N	S
Montezuma Quail	Cyrtonyx montezumae	E	G5/S2	NL	NL	(P)		S
Black Rail	Laterallus jamaicensis	NL	G5/S2	NL	NL	P	N	S

Table 1, Continued.

Com. name	Sci. name	TOES	TNHP	TPWD	USFWS	Route		
Whooping Crane	Grus americana	E	G1/S1	E	E	P	N	S
Western Snowy Plover	Charadrius alexandrinus nivosus	NL	NL	NL	Cat. 2	P	N	S
Piping Plover	Charadrius melodus	NL	NL	T	T	P	N	S
Mountain Plover	Charadrius montanus	NL	G3/S2	NL	Cat. 2	P	N	S
American Oystercatcher	Haematopus palliatus	NL	G5/S2	NL	NL	P	N	S
Northern Jacana	Jacana spinosa	T	G5/S3	NL	NL	P		S
Eskimo Curlew	Numenius borealis	E	G1/SX	E	E	P	N	S
Long-billed Curlew	Numenius americanus	NL	NL	NL	Cat. 2	P	N	S
Coastal Least Tern	Sterna antillarum antillarum	T	NL	NL	NL	P	N	S
Interior Least Tern	Sterna antillarum athalassos	E	G4T2/S2	E	E	P	N	S
Sooty Tern	Sterna fuscata	NL	G5/S2	T	NL	P		S
Black Skimmer	Rynchops niger	T	NL	NL	NL	P	N	S
Buff-bellied Hummingbird	Amazilia yucatanensis	NL	G4/S2	NL	NL	P		S
Ringed Kingfisher	Ceryle torquata	NL	G5/S2	NL	NL	P		S
Cave Swallow	Hirundo fulva	NL	G5/S4	NL	NL	P		S
Steller's Jay	Cyanocitta stelleri	NL	NL	NL	NL	P	N	S
Fish Crow	Corvus ossifragus	NL	G5/S4	NL	NL	P	N	S
Migrant Loggerhead Shrike	Lanius ludovicianus migrans	NL	NL	NL	Cat. 2	P	N	S
Black-capped Vireo	Vireo atricapillus	NL	G2?/S2	T	pr. E	P	N	S
Golden-cheeked Warbler	Dendroica chrysoparia	T	G3/S3	T	Cat. 2	P	N	(S)
Worm-eating Warbler	Helmitheros vermivorus	NL	G5/S3	NL	NL	P	N	S
Swainson's Warbler	Limnothlypis swainsonii	NL	G4/S3	NL	NL	P	N	
Bachman's Sparrow	Aimophila aestivalis	NL	G3?/S2	T	Cat. 2	P	N	
Henslow's Sparrow	Ammodramus henslowii	NL	G3/S3	NL	Cat. 3A ssp.	P	N	S
Audubon's Oriole	Icterus graduacauda	NL	G5/S4	NL	NL	P		S
Red Crossbill	Loxia curvirostra	NL	G5/S3	NL	NL	P	N	S
Ghost-faced Bat	Mormoops megalophylla	NL	G5/S2	NL	NL	P	N	S
Hairy-legged Vampire	Diphylla ecaudata	NL	G5/S1	NL	NL			(S)
Big Free-tailed Bat	Tadarida macrotis	NL	G5/S3	NL	NL	P	N	S
Texas Pocket Gopher	Geomys personatus	NL	G5/S4	NL	NL			S
Eastern Harvest Mouse	Reithrodontomys humulis	NL	G5/S4	NL	NL	P		
Swift Fox	Vulpes velox	T	G4/S3	NL	Cat. 2	P	N	S
Black Bear	Ursus americanus	T	G5/S3	E	Cat. 2 ssp.	P	N	S

Table 1, Concluded.

Com. name	Sci. name	TOES	TNHP	TPWD	USFWS	Route		
Coati	Nasua nasua	NL	G5/S2	E	NL	P		S
River Otter	Lutra canadensis	T	G5/S3	NL	NL	P	N	
Ocelot	Felis pardalis	E	G2?/S1	E	E			S
Jaguarundi	Felis yagouaroundi	E	G4/S1	E	E	P	N	S
Fin Whale	Balaenoptera physalus	NL	G2/S1	E	E	P	N	S
Blue Whale	Balaenoptera musculus	NL	G2/S1	E	E	P	N	S
Black Right Whale	Balaena glacialis	NL	G2/S1	E	E	P	N	S
Rough-toothed Dolphin	Steno bredanensis	NL	G?/S1	T	NL	P	N	S
Bottle-nosed Dolphin	Tursiops truncatus	T	G?/S2	NL	NL	P	N	S
Atlantic Spotted Dolphin	Stenella plagiodon	NL	G?/S1	T	NL	P	N	S
Short-snouted Spinner Dolphin	Stenella clymene	T	G?/S1	NL	NL	P	N	S
Long-snouted Spinner Dolphin	Stenella longirostris	NL	G?/S1	NL	NL	P	N	S
Pygmy Killer Whale	Feresa attenuata	T	G?/S1	T	NL	P	N	S
False Killer Whale	Pseudorca crassidens	NL	G?/S1	T	NL	P	N	S
Short-finned Pilot Whale	Globicephala macrorhynchus	NL	G?/S1	T	NL	P	N	S
Killer Whale	Orcinus orca	NL	G?/S1	T	NL	P	N	S
Goose-beaked Whale	Ziphius cavirostris	NL	G?/S1	T	NL	P	N	S
Gervais' Beaked Whale	Mesoplodon europaeus	NL	G?/S1	T	NL	P	N	S
Dense-beaked Whale	Mesoplodon densirostris	NL	G?/S1	NL	NL	P	N	S
Dwarf Sperm Whale	Kogia simus	T	G?/S1	T	NL	P	N	S
Pygmy Sperm Whale	Kogia breviceps	T	G?/S1	T	NL	P	N	S
Sperm Whale	Physeter macrocephalus	E	G2/S1	E	E	P	N	S
Manatee	Trichechus manatus	E	G2?/S1	E	E	P	N	S
Number of species of probable occurrence (all three routes):						83	83	83
Number of species of probable occurrence (one or two routes):						23	7	19
Number of species of possible occurrence (shown in parentheses):						3	2	7
TOTAL						109	92	109

LETTER 53

March 17, 1987

Bureau of Land Management
1695 Spruce Street
Riverside, California 42507

Dear Sir:

Thank you for the opportunity to comment on the proposed All American Pipeline Project. I will direct my comments specifically to those issues which are addressed in the Bureau of Land Management's Draft Supplemental Environmental Impact Statement produced January, 1987. Additionally, I have attached a letter dated August 28, 1986 directed to Mr. Haigh at the Bureau of Land Management because it contains much specific, valuable information regarding the impact to jobs, the tax base, and the Hays County economy in general if the Aquifer and the San Marcos River were to become polluted at all.

Concerning the Draft Supplemental Environmental Impact Statement, I have the following comments:

1. Page S-3, Major Impact Conclusions:

53-1 The Statement suggests that the significant construction impact is focused to a great degree on the loss of riparian habitat. In my opinion, it does not address the significant impact which would be felt by the tourist based economy here in Hays County. This part of the impact statement should include addressing the issue of the loss of commerce in this area. I direct you to my attached letter for the specifics of what this would do. It is estimated that 600,000 tourists visit Hays County each year. 450,000 people visit AQUARENA SPRINGS, a resort dependent on the unpolluted San Marcos River for its survival.
Recent spills in the Austin area along pipeline routes have gone directly into the Aquifer and have shown up immediately in underwater pools and in caves. I direct your attention to the attached copy of the newspaper article from the Austin-American Stateman dated August 20, 1986 when such a spill occurred.

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RESPONSE TO LETTER 53

53-1 The major impact conclusions paragraph found on page S-3 of the Draft SEIS indicates that construction impacts to recreation resources are not significant. This is due to the short duration of the construction period. However, the same paragraph does identify recreation as an area of major impact if an oil spill were to occur on a stream or river. In addition, Table 2-12, page 244 identifies recreational resources potentially affected by oil spills, and Section 4.2.11.3, paragraph 2, page 4-93 specifically identifies Aquarena Springs as a potentially impacted area if an oil spill did occur.

LETTER 53

53-2

2. Page S-3, BLM Preferred Alternative:

Under this section, the statement suggests that the likelihood of ground water contamination is small. This is simply not true. Again, I would direct your attention to the article on the pollution of the Aquifer which happened as a result of the spill in southwest Travis County which happened on August 20, 1986. We have found through research near the San Marcos River that by inserting dye into different crevices near the surrounding springs that within hours the dye shows up in the springs. This confirms the fact that this is an extremely sensitive area and one in which any spill, no matter how remote the possibility of it occurring may be, cannot be controlled and will pollute the Aquifer. By bringing the pipeline through Hays County you would be saying that it is all right to pollute the Aquifer to a degree which is acceptable by theoretical standards. Clean water is not a concept which can be compromised in this way.

53-3

3. Page S-5, No Project Alternative:

I am happy to read on page S-5 that the report states, "an oil spill along the Proposed Route can still pose a significant risk to the Edwards Aquifer, despite an intensive mitigation program." It is clear that the Bureau of Land Management believes that the probability of an oil spill nears absolute certainty and that a set of solutions does not exist which solve this problem. Therefore, we are looking at a situation in which the Aquifer will be polluted to a degree and we are only debating to what degree, greater or lesser, that it will be polluted. We should be protecting the existing pristine condition of the Edwards Aquifer, not debating the acceptable level of degradation.

53-4

4. Page 1-6, Environmental Review Process:

When the Bureau of Land Management did their series of hearings last fall, they asked all attendees and participants to rank in order of importance what they thought to be the major issues. As stated in the report, the Edwards Aquifer and its pollution was the number one issue. Among the top seven were: the public water supply, sensitive wildlife, and local economies. Clearly, all of these issues in Hays County are encompassed in the pollution of the Edwards Aquifer.
To accept anything other than an absolute solution by routing the pipeline to the north or south of the Aquifer would be to assure us that at some point in the future all of these top seven priorities would be ignored in the interest of moving crude oil across our state.

53-5

5. Page 3-39, Section 3.2.6.3., Threatened and Endangered Species:

On this page of the report, it states that no endangered species

RESPONSE TO LETTER 53

53-2 Your comment regarding your disagreement with the Draft SEIS statement that the likelihood of groundwater contamination is small is noted. This Draft SEIS statement takes into account the probability of a spill, the susceptibility of an aquifer, and spill containment and cleanup considerations.

53-3 Your comment regarding protecting the Edwards Aquifer is noted. Please refer to the response to Comment 1-1 regarding the vulnerability of the Edwards Aquifer.

53-4 All potential impacts associated with each of the routes were evaluated, including public water supplies, sensitive wildlife, and local economies. Please see the Modifications and Corrections section for Table 2-12.

53-5 Your comment regarding the analysis of threatened and endangered species on page 3-39 is noted. The information presented in Section 3.2.6.3 considered streams crossed by the pipeline (lines 1 through 3), as well as the Edwards Aquifer (lines 3 through 21). As discussed in lines 3 through 21, the Edwards Aquifer was included in the impact analysis.

LETTER 53

53-5 Cont.

occur in the streams which are crossed by the pipeline. While this statement is technically true, it ignores the fact that the Edwards Aquifer is considered an underground stream which is directly accessible from a myriad of cracks, crevices, and holes throughout this area of Texas. The Aquifer operates for all practical purposes as an underground river. In fact, currently one group of Texans concerned about long term water issues is seeking the designation of "underground river" for the Edwards Aquifer. This concept of the pipeline not crossing any streams is correct in absolute terms, however, by the definition of the term stream it is incorrect since it has all of the characteristics of a stream. I believe that the Aquifer should be considered as a stream for this analysis.

53-6

There are many pressures on the Texas economy right now. One is for jobs in the oil industry and specifically for jobs in oil refineries which are significantly underutilized at this time. The decision on whether or not to ship this oil to Texas is of a broader scope than needs to be addressed here and is a decision that should not be contemplated by us. All American's pipeline qualifies as a common carrier. Therefore, the oil or other liquids which goes through this pipeline could have any number of unknown qualities which would be going through an exceptionally environmentally sensitive area. In all cases, for many reasons, this should be avoided. The drinking water supply of not only this area of the Hill Country, but the city of San Marcos as well as the city of San Antonio depends on clean water from the Edwards Aquifer.

To do less than to move this pipeline to the northern route would condemn this area of Texas to certain disaster in the area of significant pollution in the near term future and additionally burden the United States government with the need to supply water on an emergency basis to this area of Texas as well as providing extensive, extreme, and expensive measures to clean up and perfect a water supply, which in its current condition is adequate as to quality and quantity for the Central Texas area.

Cordially,

J. Lloyd Moore
Chairman/CEO

JLM:ktp

Enclosures

RESPONSE TO LETTER 53

53-6 Your comment regarding support for the Northern Alternative and opposition to the Proposed Route is noted.

Because of the overall complexity of the project and the total size of the document, we felt it was most helpful to provide the pertinent facts relative to environmental consequences on the Affected Environment for each of the current alternatives. Providing earlier route scenarios would likely confuse most readers and hinder the reader in coming to conclusions.

August 28, 1986

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, California 42507

Dear Mr. Haigh:

Thank you again for coming to San Marcos to hold a public hearing on proposed All-American Pipeline. Per your request I am committing to writing many of the facts which I gave you during my presentation on Monday evening.

Regarding the economic impact to San Marcos: The San Marcos and Hays County economy is very much tourist oriented. In my opinion this has not been focused on in the past because of the substantial influence Southwest Texas State University, as the primary employer in town, has had on the town. However, tourism in Hays County is very strong. The following is a list of facts about tourism in Hays County:

1. 600,000 tourists visited Hays County this past year (450,000 of those visited Aquarena Springs).

2. This produced 6.2 million in paid admissions and an additional 4 million in hotel/motel room revenues for a total of 10.2 million.

3. This total of 10.2 million funded 660 jobs with an annual payroll of over 5.7 million (420 of these jobs are at Aquarena Springs).

4. 798,000 in state taxes were paid and 490,000 in local taxes were paid.

5. Hays County ranks 31st out of 254 counties in Texas in tourist travel expenditures.

6. 31 million in total tourist travel expenditures were spent in Hays County with 27.9 million dollars being spent in San Marcos.

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7. River related institutions and industries are conservatively estimated to account for 80% of this total. One example would be that the Lion's Club, a nonprofit organization here, raises almost all of its annual funds for the benefit of the community through tube rentals for people tubing down the San Marcos River. This brought in over $40,000 last year.

Statewide, tourism is a 14.5 billion dollar industry second only to oil and gas in revenues for the State through taxes. It is anticipated that with the current decline in oil prices that tourism will be the number one industry in Texas this next year.

Environmental impact on the upper San Marcos River as a result of any spill or leakage would destroy the habitats of several endangered species. The entire world population of Texas Wild Rice, the San Marcos Dwarf Salamander, and the San Marcos Gambusia are in the upper San Marcos River. Almost the entire world population of the Fountain Darter is also there. The San Marcos Gambusia and the Fountain Darter are both protected by the Federal Government in that they are on the "Federal Endangered Species List."

Another landmark here in San Marcos is Ezell's Cave which is a direct hole into the Edwards Aquifer. It has yielded 36 species of animals, 8 known to be found only in this cave and 4 yet to be identified by taxonomists. Of those 8, the San Marcos Blind Salamandar is one. I refer you to the attached brochures which I gave you copies of at the meeting. I am sending these in the event that the others have been misplaced or given to other resources once you returned to the office.

I reiterate my invitation to you or anyone on your staff or related entities to please come and tour Aquarena Springs. You will see 150 million gallons of pure water coming out of the Aquifer every 24 hours. This is enough to completely replenish our 21 acre lake twice daily. You will be able to peer down over 40 feet to see the sands moving in the Springs and to see over 200 varieties of fish and plant life thriving in the constant 71° temperature water.

There was some discussion at the hearing as to whether or not a minor oil spill would be of major importance in the general scope of things. Much discussion was held regarding the fact that in the event of a spill it would affect only the top of the Aquifer and that the oil would essentially float on the top.

You must understand how disturbing we find this concept since it is generally accepted that it is the water at the top of the Aquifer that is coming out through the Springs. Therefore it is safe to assume that in the

event of a spill that the Springs would be the first place that this would show up and this would immediately pollute the headwaters of the San Marcos River as well as Barton Springs.

Please understand in my comments above that I am really speaking in a much broader range than the individual economy of our business here at Aquarena Springs. Although we have two restaurants, glass bottom boats, a Submarine Theatre, a Skyride, Historic Texana Village, 25 room historic Hotel, a nine hole golf course and Pool Club the impact to our 6.5 million dollars in revenues to the local economy would be pale in comparison to the significance of ruining this international treasure, the San Marcos River. We have had biologists and other scientists come to the river and stare in disbelief at the clarity and purity, and the natural setting which has been maintained to this date. This is truly a natural phenomenon which has been preserved in its natural state despite the urbanization of Hays county. To consider any pipeline or any industry which would potentially pollute the most unique and viable resource that we have in this area should be unthinkable.

Because I was so outspoken at the hearing, I am sure you remember me and you will remember that I asked several questions at the end of the hearing directed to All-American. I encourage you to delve further into the issue of why they are forced to bring this oil to the Texas refineries. I am certain of the fact that the emission control standards in California prohibit further refining of this type of oil to the extent necessary to service the amount of oil coming into California from Alaska.

While there is additional capacity available in California for refining the appropriate type of oil, in order to refine this oil in California, they must trade capacities with cleaner types of oil that will be less toxic when released into the atmosphere, clearly the capacity for this type of refining is not available. I think it is interesting and significant to note that three different representatives from All-American have approached me since that discussion to try to change my mind. This is not their typical way of operating. Typically they have ignored my request for information and my comments. I feel very strongly that this kind of attention means that I have stumbled onto something with which they do not want to deal.

Again, I respectively request that you ask secondary and tertiary questions about the item regarding emission quality control standards in California. Clearly there are incredible barriers to production of this oil in California or it would not be economically feasible to ship it halfway across the United States to Texas.

Thank you for your time and commitment to this issue. I look forward to

visiting further with you or anyone in your group. I will be pleased to show you Aquarena Springs and the San Marcos River on your next trip to Texas.

Cordially

J. Lloyd Moore

J. Lloyd Moore
Chairman/CEO

JLM:ktp
enclosures

cc Congressman J. J. (Jake) Pickle w/enclosures
Mayor J. E. Younger w/enclosures

Cave fumes blamed on oil pipeline spill

Vapors detected in Southwest Travis County

By Bill McCann
American-Statesman Staff

An oil spill that occurred nearly three months ago in rural Southwest Travis County is believed to be responsible for high levels of hydrocarbon vapors that have turned up in three caves — one nearly two miles from the spill.

The discovery has caused renewed concern about the spill of about 2,300 barrels of crude oil in late May when earth-moving equipment punctured an underground pipeline operated by the Shell Pipeline Corp.

"We can't be 100 percent sure that the hydrocarbons in the caves are from the spill, but we are assuming that is the case," said Shell spokesman Mike Hays.

Experts monitoring the spill continue to believe that no oil has reached either the Edwards Aquifer or Slaughter Creek, which is about 1,000 feet south of the spill site, Hays said. But he said Shell will take no chances.

Workers plan to drill two monitoring wells into the aquifer, possibly next week. Drinking water wells in the area — including Sunset Valley, about four miles northeast of the site — will also be tested, according to officials.

"We don't anticipate finding any problems with the water, but we want to take the extra precautions," Hays said. "We are committed to doing what is right and necessary."

The spill site is on the edge of the aquifer recharge zone about 1.5 miles south of U.S. 290 and east of Camp Ben McCulloch Road. One cave is about 2,000 feet southeast of the site. The others are northeast, one about a mile away and the other 9,500 feet away.

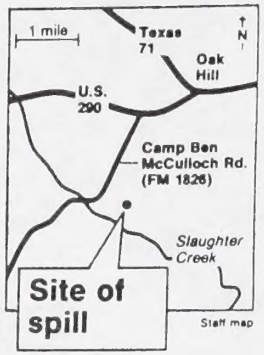
Investigators theorize that some of the crude oil that seeped into the ground turned to vapors that moved within fissures in the rocks to the caves, Hays said. They do not believe that any liquid oil seeped into the caves.

The three caves were sealed as a precaution after investigators measured airborne hydrocarbon levels ranging from 50 to 200 parts per million in the caves, Hays said. The levels were "potentially hazardous" to anyone who might try to enter the caves, he added.

A team of experts monitoring progress of the cleanup met with officials of Sunset Valley last week to discuss the status of the work and findings so far, said Sunset Valley Mayor Larry Hada.

"So far there hasn't been any contamination of the water, and we don't think there is any reason to be alarmed at all yet," Hada said.

The accident occurred as workers for the Garey Construction Co. were using heavy equipment to rough out an extension of Slaughter Lane, which is to cut across the Circle C municipal utility districts owned by developer Gary Bradley.



Staff map

Workers have carried off more than 2,000 barrels of the oil, and 100 to 150 barrels have evaporated or have been treated by plowing the area, according to Hays. Special trenches being used to capture the oil continue to collect up to half a barrel a day, he said.

The spill has already cost an estimated $500,000 in cleanup and monitoring work, and could cost twice that before the job is completed, Hays said. Shell has hired Radian Corp. of Austin to research and monitor the spill. Monitoring is expected to continue for at least a year, he said.

The problems with the spill come amid debate over plans by the All American Pipeline Co. to put a heated oil pipeline over the aquifer through Hays County.

Wednesday August 20, 1986

LETTER 54

March 17, 1987

William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Sirs,

54-1 I feel that the Federal Supplemental Draft EIS concerning the All American Pipeline Company is a well prepared analysis with only a few discrepancies. It seems obvious that the heavy crude oil pipeline should be moved from our precious water sources because the water sources cannot be moved. I feel that it would be foolhardy, unwise and unnecessary to place the water supply of several million people in such obvious danger.

I believe that the No Project Alternative is the best for Texas. Such an extensive crude oil pipeline would cause air and water pollution damage which by far outweighs the benefits derived from the oil itself. However, if a route is to be taken through Texas, then the Northern Alternative encompasses less danger than the other two and should be considered rather than the Central and/or Southern routes.

I have the following complaints regarding the Supplemental Draft EIS:

54-2 1. Insurance - I feel that 10 million dollars for insurance is unrealistically low for any area in which the pipeline follows. Although 10 million dollars is a substantial amount, the extensive damage a leak would entail by far surpasses that amount.

54-3 2. Trees - Oak wilt disease and oak decline are important factors involved in Gillespie and surrounding counties. However, the draft EIS hardly mentioned these diseases which destroy vast amounts of oaks in this area. For instance, the draft EIS did not state that the dozer blades used for construction is believed to cause rapid spreading of oak decline. The draft EIS did not state that a definite cure for these diseases have not yet been discovered and once a tree becomes infected it will result in death. Most important, with the destruction of oaks in this area, the food, shelter and beauty these oaks provide will be destroyed. As a result, the wildlife and stock would suffer severly, as well as the tourist attraction oak trees provide in this area.

54-4 3. Ellenburger Aquifer - I feel that the water supply of the City of Fredericksburg deserves some mention in the draft EIS. If this aquifer would be polluted, then the City of Fredericksburg would be without water.

Thank you for the time and energy the Bureau of Land Management and other agencies put into the draft EIS.

Sincerely yours,

Elgin Pape

Elgin Pape
Kerr Rt, Box 230
Harper, TX 78631

EP/dlp

RESPONSE TO LETTER 54

54-1 Your comment regarding your primary choice for the No Project Alternative and secondary choice for the Northern Alternative is noted. Please refer to the Modifications and Corrections section for page 4-172 and Impact Summary in Section 3.4.

54-2 Please refer to the response to Comment 18-2.

54-3 Thank you for commenting. Please refer to Mitigation Measure TB-7 which discusses construction equipment decontamination measures to reduce the spread of disease to oaks. Implementation of the mitigation measure would minimize impacts to the vegetation communities and wildlife habitat. Also see page 3-46 of the Draft SEIS which discusses the rapid death of oaks once they are infected.

54-4 Please refer to the response to Comment 21-2.

LETTER 55

March 17, 1987

William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Sirs,

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Thank you for the time and energy the Bureau of Land Management and other agencies put into the draft EIS.

Sincerely yours,

Diane Pape

Diane Pape
2204 Zysko
Kerrville, TX 78028

LP/dlp

RESPONSE TO LETTER 55

55-1 Please refer to the response to Comment 54-1.

55-2 Please refer to the response to Comment 18-2.

55-3 Please refer to the response to Comment 54-3.

55-4 Please refer to the response to Comment 21-2.

LETTER 56

WILDLIFE CONSERVATION

SIERRA CLUB — LONE STAR CHAPTER

March 18, 1987

William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Bill,

Enclosed are the comments of the Lone Star Chapter of the Sierra Club concerning the Draft Environmental Impact Statement (DEIS) for the All American Pipeline project. As we have indicated in the past we question the need for this project as proposed. We will outline our major concerns and then follow these with our specific, page by page, comments.

Major Concerns

56-1 1) The need for this project seems to be in question. Recent articles in the press (copies enclosed) indicate that Celeron has not even signed on any customers for use of this pipeline. According to industry sources this is a very unusual circumstance. In addition due to a variety of market conditions, including low prices, expense of extracting heavy crude oil, and environmental concerns, California OCS production is far below predicted extracted volume. Industry analysts say that prices will have to rise to $25/barrel before significant drilling recovery occurs. Due to all of these uncertainties we question the economics and need that this pipeline was projected to fulfill. In addition there seems to be indications that use of California heavy crude will displace some Texas crude. A new evaluation of economic trends in the oil indistry and how these relate to building of this pipeline needs to be done for the FEIS. Such an analysis needs to include impacts on use of Texas crude as far as its displacement by California crude goes. Finally, Robert Cercer, Goodyear's chief executive, was quoted last year as saying the pipeline only needs to carry 100,000 barrels/day to break even. The question then is: Why build it so big? Surely a project of this magnitude cannot have 2/3's of its capacity remain idle and expect to turn a profit. This does not make economic or efficiency sense.

56-2 2) The BLM is presently in violation of the National Environmental Policy Act and the Council on Environmental Quality's regulations because it has allowed the piecemeal construction of this pipeline before an adequate EIS has been filed on the entire project. CEQ is quite specific concerning this, "Until an agency issues a record of decision ... no action concerning the proposal shall be taken which would: (2) limit the choice of reasonable alternatives.". CEQ regulations also state, "Agencies shall not commit resources prejudicing selection of alternatives before making a final decision". Finally CEQ says, "Proposals or parts of proposals which are related to each

RESPONSE TO LETTER 56

56-1 A number of reviewers have commented on the purpose and need for the All American Pipeline. The following response addresses AAPL's objectives, crude oil demand, refinery capacity, transportation, and the world and U.S. economic and political issues of the oil industry relative to this project.

The All American Pipeline is part of the very complex energy production industry. The need and importance of the All American Pipeline is not "black" or "white." In the free market system, the entrepreneur determines the rewards for executing a venture.

AAPL has embarked on a venture based on surplus crude oil production on the West Coast (PADD 5) and a market demand in excess of production in the eastern U.S. The eastern U.S. has the refining capacity to process the types of surplus PADD 5 crude oil available. The oil could be transported by pipeline or tanker. AAPL proposes a pipeline due to economic and political decisions. Section 3.2.12.6, Economic Supply and Demand of West Coast Crude Oil, pages 3-93 through 3-107 in the Draft SEIS, evaluates the basis for the proposed All American Pipeline.

The project has a variety of benefits that are economic and political in nature. These benefits include the use of U.S. labor and some U.S. materials, and supplementing of the local, state, and federal tax base. The entire project would be on U.S. soil and would not be subject to regulation by foreign countries such as Panama, and would allow the use of oil produced in the U.S. rather than foreign-produced crude such as Venezuelan or Mexican. The economic and political value of the All American Pipeline rests on the events in the future.

Some reviewers have asked how the All American Pipeline complements future needs. We would like to answer the question by first summarizing the overall future position of the oil and gas industry and secondly how the All American Pipeline would be affected.

The 1987 Oil and Gas Journal Data book (Oil and Gas Journal 1987a) presents a summary of past events and likely future events that are summarized here:

- In the 1970s OPEC increased oil prices tenfold.
- The users reacted with conservation and self-sufficiency.
- OPEC lost market share and in December 1985 attempted to regain market share by reducing prices up to 70 percent during the spring and summer; prices were reduced on an average of about 50 percent for the year.
- Profitability for all oil producers declined and with it U.S. capital investment for exploration, production, and refining fell from a peak of $83 billion of investment in 1981 to $27 billion in 1986. Active oil rigs fell 76 percent from the peak year.
- The industry has excess production and refining capacity which will remain for a while.
- Demand has already increased 3 percent in the U.S. in response to the lower prices.

LETTER 56

56-2 Cont. other closely enough to be, in effect, a single course of action shall be evaluated in a single impact statement.". The McCamey-Webster leg was part of the original EIS and is only a section of the entire project. Therefore this DEIS should have been completed before any construction on the pipeline began. Your actions prejudice the entire decision and are illegal.

3) Because of the aforementioned bias the true no action alternative has been rendered meaningless in this document. The supposed no action alte native in this DEIS is in fact not a no action alternative since it would allow oil to go through the part of All American Pipeline already illegally built and then through an existing network of pipelines to the refineries on the Gulf Coast. No action means just that, no deviation from before project conditions. Before project conditions, in this instance, means that there is no All American Pipeline in existance.

56-3 4) The supposed no action alternative used in this DEIS, the use of existing pipelines to get crude to the coast, has not been equivalently analyzed versus the proposed segment alternatives and a true no action alternative. As CEQ regulations state, "Devote substantial tretment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.". In addition you have also given inadequate development to the retrofitting of refineries in California, which according to figures you have gathered, may redice substantially or eliminate the need for this pipeline. Finally, as we stated in our comments concerning the previous Draft and Final EIS's on this project, all reasonable alternatives must be looked at. This would include an energy conservation alternative.

56-4 5) This DEIS gives preferential treatment in the form of additional mitigation to the Edwards Aquifer. It is the Sierra Club feeling that all important aquifers are equally valuable and must be equally protected. Therefore the smae protective features, specially provided for the Edwards Aquifer must also be provided for all other aquifers.

56-5 6) Stream protection is given short shrift in this DEIS. Open dredging of stream bottoms is allowed, not all streams have automated valves or valves at all, and there is no directional drilling of the pipeline for stream crossings. We feel the significance of streams has bee artibrarily defined sto that money can be saved in construction costs. When it comes to spending money versus contaminated surface or groundwater sources the Sierra Club supports spending the money. This DEIS does not advocate this policy. Old data is used for oil spill analysis, mealth effects are ignored or stated in a way to try and minimize their impacts, and freshwater lakes used for drinking water, like Twin Buttes, are not fully protected against oil spills.

56-6 7) The DEIS also minimizes the impacts that will occur to the Concho Water Snake and other listed species. With the Stacy Dam, this pipeline and other modifications of stream and water quality will result in almost certain extinction of the CWS. The pipeline should be directionally drilled under the Colorado River so it will not disturb riparian and CWS habitat. The Black-Capped Vireo has been proposed for listing as endangered. The Attwaters Prairie Chicken will be adversely impacted by the pipeline. Definite mitigation of habitat including purchase and maintenance of habitat must be required for all endangered species impacts.

56-7 8) The oil spill risks are far too high from this project. BLM has arbitrarily used a less meaningful data base to determine oil spill hazards and then has minimized risks by saying they will be low or damage can be sufficiently cleaned up. The response times of two or more hours are much too great for a pipeline this size, especially since manual valves will be used at many locations. Sev ral more pipeline stations where

RESPONSE TO LETTER 56

- Oil and Gas Journal Economics Department forecasts world demand will grow almost 10 percent in the next 5 years, and thus return to the peak levels of 1979. This growth assumes a major role for conservation (e.g., more efficient automobiles, buildings, and machinery).
- In the future, U.S. production will likely continue to decline, and OPEC production will increase.
- U.S. demand may rise only 1,000,000 BPD in five years, but because of the production decline, imports will rise 2,500,000 BPD.
- The U.S. oil industry will respond to the price, and when the price is low, demand will grow, and U.S. exploration and production will decrease.
- Price is not determined by economic forces alone; politics have historically been a dominant factor.
- A single dominant company, group of companies, influential government agency, or a cartel of exporting nations have historically influenced price.
- In the near future, prices will likely continue to fluctuate and reflect a combination of market and political factors.

The above summary has been interpreted relative to the All American Pipeline in the following way:

- The eastern U.S. will continue to grow in demand.
- As long as the price does not collapse (e.g., $10 to $15 per barrel), PADD 5 will have excess production.
- AAPL will provide a cost-effective transport mode from PADD 5 to the eastern U.S.
- If the price collapses, the Alaska and California production will likely decrease, and surplus production will decrease; however, this would occur over a long period of time.
- Within any given period, the eastern U.S. will need to import oil, however, the amount of excess West Coast oil used will be dependent on the volume of oil produced.

56-2 The McCamey to Webster section was not addressed by the 1984 EIS. A substantially different route to Freeport was being considered by AAPL for a future pipeline at the time the original EIS was prepared. BLM considered the impacts of that McCamey to Freeport proposal in the 1984 EIS as an alternative means of shipping All American's crude oil from what AAPL at that time identified as its terminus to the Gulf Coast. AAPL did not decide to construct a pipeline to Webster until well after the original Final EIS was prepared. Lack of an analysis of McCamey to Webster is the reason this supplement is necessary. Please see pages 1-1 and 1-2 of the Draft SEIS.

56-3 Please see the Modifications and Corrections section for pages 2-37 and 4-172, for discussion of the No Project Alternative. A greater level of detail is provided on the tankering alternative and the use of existing pipelines.

LETTER 56

56-7 Cont. personnel and equipment are locate and within one hour from any part of the pipeline are needed. A worst case spill is not modeled since the 20 miles of insulated line after each heating station are not used in the spill scenario.

56-8 9) There is absolutenly no analysis of pipeline accidents at the oil terminal where this oil pipeline will end in Texas City or of tanker accidents from this terminal.

56-9 10) The air quality analysis is atrocious. The worst pollutant problem on the Gulf Coast, ozone, is not even discussed. Yet with additional NOx's and HC's, there will be more ozone formed. The Houston area is nonattainment for ozone but this fact is never mentioned and analyzed. Also greater amounts of heavy metals, TSP, and toxic organic compounds will be emitted by the pipeline and or the refineries that use this heavy crude but these pollutants either are not discussed or are summarily passed over. Why should Texans have to breath dirtier air because California does not want air pollution producing refineries or does not want to spend the money to put controls on its existing refineries? Our lungs are just as sensitive to airborne sickness and disease and we want equal consideration for our health. Primary and secondary air pollution is one of the prime impacts of this pipeline and must be addressed.

56-10 11) Noise and visual impacts have been low-rated and arbitrarily given good mitigation marks when in fact their effects will be significant. Complete mitigation is required.

As a result the Lone Star Chapter of the Sierra Club requests that BLM revise this EIS and release it as a supplemental draft document so that reviewers can have the opportunity of commenting on the adequacey of the major issues we have mentioned above that must be revised. The following pages will contain our specific, page by page, comments on this DEIS.

Sincerely,

Brandt Mannchen

Brandt Mannchen
Chair, Water Resources Committee
Lone Star Chapter of the Sierra Club
1515 Missouri #17
Houston, Texas 77006
H713-522-1489, W713-645-5316

RESPONSE TO LETTER 56

A No Project Alternative in the SEIS which assumed no pipeline had been constructed would be highly misleading, a false alternative. The pipeline west of McCamey has been constructed. To be viable, a No Action Alternative must address conditions as they exist at the time the EIS is prepared.

The comment regarding the No Project Alternative in retrofitting of refineries in California is noted. Please refer to the response to Comments 6-1 and 56-1.

56-4 The Edwards Aquifer was identified during the scoping process as an important resource to the citizens of the State of Texas because of its sensitivity. Much of it has been designated by the EPA as a sole-source aquifer. The solution limestone formation of the Edwards Aquifer recharge zone is much more susceptible to oil spill contamination than are other formations. The mitigation measures described in the Draft SEIS have been applied to those areas where significant impacts may be expected to occur. There is no need to enforce mitigation across the board to areas of the route which do not require similar protection.

56-5 Your comment is noted; please refer to Mitigation Measures SW-1 and SW-2 in Appendix A. Impacts to lakes and rivers are addressed in the response to Comment 6-4. Additional details of mitigating oil spill impacts on streams are discussed in the Oil Spill Contingency Plan in Appendix B of the Draft SEIS.

Please refer to the Modifications and Corrections section for page 4-10 which contains more recent data on spill statistics.

56-6 Your comment on threatened or endangered species is noted. For species where sufficient data are lacking for impact projections, additional field surveys are being conducted (primarily for federal listed species described in the Biological Assessment). It is possible that the pipeline will be slightly realigned to avoid critical Concho water snake habitat, as determined through field surveys. Construction of the project would add about 1 acre or 200 ft of streambed lost to the Stacy Dam operation, which will eliminate many miles of the snake's primary habitat. This crossing is in bedrock and directional drilling is infeasible for this diameter of a line (see Mitigation Measure B-9 in Appendix A).

Field surveys were conducted for the black-capped vireo, in June 1987. Realignment to avoid important habitat or construction delays during the nesting season are being required as mitigation measures.

Field surveys of the Attwater's greater prairie chicken were completed in conjunction with the TPWD survey, March 1987, and results were submitted to TPWD, USFWS, and BLM. These surveys identified potential impacted areas primarily along the Northern Alternative near Sealy and Orchard. AAPL agreed to pipeline realignment at Orchard and construction constraints at Sealy to avoid impacts to these populations. The USFWS has prepared a Biological Opinion (Appendix C) and has prepared Mitigation Measure TB-10 in Appendix A.

LETTER 56

Specific Comments on the Draft Environmental Impact Statement for All American Pipeline

56-11 1) S-3, document the assertion that, "... the likelihood of groundwater contamination is mall ...".

56-12 2) S-3, document the assertion that, "Socioeconomic impacts would be minimal.".

56-13 3) S-3, another significant construction impact will be the loss of live oak forests.

56-14 4) 1-1, please explain the relationship of Celeron to Goodyear. It is our understanding that Goodyear is trying to sell Celeron.

56-15 5) 1-4, Table 1-1, there is no water quality board or water resource commission in Texas. There is a Texas Water Commission and Texas Water Development Board.

56-16 6) 1-5, adequate mitigation requires that an authorized officer conduct an environmental and engineering review of the construction and use plan. This must be done and in addition monitoring and enforcement of the construction and use plan needs to be mandatory to ensure all mitigation is done and done correctly.

56-17 7) 1-6, we object to this ranking. We refused to rank at the scoping hearing because we did not believe this was an objective and comprehensive way to deal with environmental concerns. Just because more persons rank a certain concern does not mean a lesser ranked concern or one not mentioned at all should be ignored or be little covered. Under NEPA BLM is responsible for investigating all significant environmental impacts. We were led to believe at the League City meeting that the ranking exercise would not be used to throw out concerns but was a way to get an idea of what the public thought the most important environmental concerns were. We feel as if we have been misinformed and resent this type of activity.

56-18 8) 1-7, we find it interesting to note that the Minerals Management Service in their Final EIS for Proposed Lease Sales 110 & 112 in the Gulf of Mexico, on page IV-47, indicates that pipelines have a greater inerent risk in spilling oil than tankers do (1.6 versus 0.45-0.90). Please explain how you found a different circumstance.

56-19 9) 2-3, Table 2-1, we feel it is not unreasonable to expect that remote control valves should be at every valve location. Why is not this required?

56-20 10) 2-5, since the northern alternative has one valve/13 miles (this is misleading since it is not clear if several vavles are at the same location at certain segments of the pipeline) and since 20 miles of the pipleine are insulated after each pumping station to maintain good oil flow what is the maximum and minimum spill size for a 13-20 mile section of pipe? On Table 2-4 only 24 vavle locations are shown (valves every 23 miles).

56-21 11) 2-7, why not have automated block valves on the upstream side of major river and stream crossings instead of must manual vavles? Ho long will it take to get to these and turn them off in case of an emergency? This information needs to be shown for each stream crossing or other sensitive area.

56-22 12) 2-20, we prefer burying vegetation so that nutrients will be added to the soil rather than burning vegetation which adds to air pollution. In addition a third option is to bundle vegetative material up and use it for wildlife habitat. You should give landowners this option too!

RESPONSE TO LETTER 56

The purchase and maintenance of endangered species habitat lost to pipeline construction will be required (see Mitigation Measure TB-1 in Appendix A) if, following implementation of other measures, a significant impact is still found to exist. Any residual impacts and their significance will be determined through consultation with the USFWS and TPWD. Presently, no such habitat loss has been identified.

56-7 Your concerns regarding oil spill risks are noted. Please refer to Comment 56-5 regarding the historical oil spill statistics, and to Mitigation Measure SS-2 (in Appendix A) regarding minimizing spill response times. Heated oil was included in the calculation of spill volumes for sensitive receptors downstream of pump/heater stations.

56-8 The secondary transportation impacts beyond the All American Pipeline cannot be estimated. Webster and Texas City are locations where the oil may be refined nearby, shipped by pipeline or barge to any number of Gulf Coast refineries, or even loaded on a ship as you suggest. The project's goal is to replace the foreign Venezuelan or Mexican crude; if AAPL succeeds, the tanker traffic will decrease.

56-9 Your comment regarding fugitive hydrocarbon emissions for oil storage and transfer facilities is noted. We have analyzed the air quality impacts under the unlikely assumption that crude shipped by AAPL is in addition to existing crude and doesn't replace Venezuelan or Mexican crude. Based on TACB VOC emissions projections for 1987, the total VOC emissions for Harris County are 127,469 tons/year of which 2,097 tons/year or 1.6 percent are from gasoline and crude oil storage and transfer. From results of the analysis which estimates the potential increase in refinery VOC emissions (discussed later in this response), the total estimated regional VOC emissions increase for refinery handling of the pipeline crude is 4.1 percent and 6.1 percent for 300,000 BPD and 450,000 BPD, respectively. This is based on current refining volume. If the assumption is made that a subsequent percentage increase in VOC emissions for storage and transfer is applicable, then the incremental increase in the Harris County VOC emissions from the transfer and storage of pipeline crude would be 86 tons/year or less than 0.1 percent increase in the regional VOC emissions for the 300,000 BPD scenario and 128 tons/year or approximately 0.1 percent of the regional emissions for the 450,000 BPD case.

These increases are not considered significant. Additionally, fugitive VOC emissions from crude oil storage and transfer facilities are strictly regulated by the TACB as part of the State Implementation Plan for O_3 attainment. Under this plan, no increases in VOC emissions are permitted.

Air pollution emissions by the refineries expected to receive the pipeline crude are limited by the authority of the TACB who administers the rules and regulations of the EPA and the State of Texas. These rules define the emissions limitations of major sources and fugitive sources and acceptable levels of ambient air quality. Non-attainment of these levels is against the law and is enforceable under state and federal authority. The Texas SIP, which defines emission reduction strategies to achieve attainment of all applicable NAAQS, actually imposes emission reduction requirements and has demonstrated "reasonable further progress" in reducing emissions annually.

LETTER 56

56-23 13) 2-22, we are opposed to the use of draglines to install pipe across rivers. We feel that in order to minimize spills that directional drilling should be used to put the pipeline under the riverbed. In addition this method does not cause any water quality problems or disrupt any river bed. Riparian habitat destruction is also minimized.

56-24 14) 2-24, we favor the option of allowing native grasses to grow in the ROW. This could be mandated on state lands and be an option on private lands. Quail and smaller animals would benefit from this action and in conjunction with placing vegetative bundles near the corridor could provide much needed and improved wildlife habitat.

56-25 15) 2-25, 2.2.2.10, seedlingsshould be planted in all riparian areas.

56-26 16) 2-27, 2.2.2.11.1, why is 12 inches enough clearance between pipelines? What happens during an accident?

56-27 17) 2-27, 2.2.2.11.2, it is not clear how aquatic damage due to blasting and dredging would be reduced or eliminated.

56-28 18) 2-27, 2.2.2.11.2, how will debris be prevented from falling into the river? What measures will be taken to prevent this?

56-29 19) 2-29, 2.2.2.11.3, how long will the foam last that is used to seal fractures? Describe the multiple leak detction techniques? What is the cost to clean an aquifer of contamination? If $10 million enough? All reports should be submitted quarterly so that BLM can ensure that no problems are occurring.

56-30 20) 2-30, 2.2.2.11.3, why not have the same protection for the Ellenburger Aquifer as you have for the Edwards Aquifer? The hydrostatic testing is something that is already required (see page 2-24) so it is not extra mitigation like this makes it sound.

56-31 21) 2-31, 2.2.4, we do not agree that, "All operating facilities ... would be designed for unattended operation and remotely controlled from a main control center ...", since you admit that there will be manual vavles and leaks will have to be stopped by driving to a location to turn off the valve.

56-32 22) 2-32, 2.2.4, you need to add addition maintenance centers so that personnel will be no farther than one hour away from any part of the pipeline in case of a spill.

56-33 23) 2-33, 2.2.4, please tell which pump stations or block valves during wet weather may not be accessible. They areas need automatic shutoff vavles.

56-34 24) 2-33, 2.2.5, whi oil concentration in ppm if left in the water that flushesout the abandoned oil pipeline and gone through an oi-water separator? What is this concentration's effect on aquatic ecosystems? Backfill must be required if pipesalvage occurs and settling of soil happens (lower than the natural contour). How much oil residue is left in the pipeline itself and what is the possiblity of it leaching and contaminating soil and water?

56-35 25) 2-34, 2.3.1, why not automate valves at 11 stream corssings and all valves period? What is the additional cost of this compared to the total cost of the pipeline? This is especially needed for mitigation over the Concho and Colorado Rivers where Twin Buttes Dam and the Concho Water Snake are threatened.

56-36 26) 2-37, 2.3.3, BLM should be able to determine approximate costs for your supposed no project alternative (which should be a separate alternative since it is not a no ac-

RESPONSE TO LETTER 56

Refinery emissions are limited by the TACB and are regulated by the TACB emissions permit review program. In addition, refineries are required to incorporate reasonably available control technology (RACT) to achieve area emissions reductions. There is also strict control of new or modified sources which requires a net total emissions reduction before any permit is granted. In Harris County, for example, reductions of VOCs, which are precursors to O_3 formation, are the direct result of TACB efforts to achieve attainment of the NAAQS for O_3.

The regional refineries expected to receive most of the pipeline crude have emissions limitations defined in their TACB permits which cannot be exceeded. Currently, the refineries in the Jefferson, Galveston, and Harris Counties region are estimated to be operating at about 83 percent capacity and have emissions below permitted levels. In defining the potential increases in regional emissions from refining the pipeline crude, the assumption was made that all the crude would be refined in the three-county region without displacing existing crude sources, and that emissions would increase proportional to the increase in volume of crude refined. Special considerations were not made for additional sulfur removal since many of the refineries have special supplementary sulfur recovery systems which capture the sulfur for resale.

Currently, the refineries in the Galveston, Jefferson, and Harris Counties region are estimated to have approximately 500,000 bbl of reserve refining capacity. Based on current emission rates per barrel of oil refined, the emission increases of SO_2, NO_2, VOCs, and TSP were calculated for refining an additional 300,000 barrels and 450,000 barrels per day. A summary of these estimated increases, based on the TACB emissions data for 1985, are presented in the revised Table 4-30 (Modifications and Corrections section).

Potential increases in regional O_3 formation cannot be estimated in the same fashion as the other criteria pollutants. Ozone is not emitted directly into the atmosphere but is formed in the atmosphere through a complex series of photo-chemical reactions involving certain reactive hydrocarbon compounds VOCs and NO_x. Using EPA guidelines, the TACB performed a computer modeling analysis of O_3 formation in Harris County using the EKMA technique to relate measured O_3 concentrations to emissions of VOC and NO_x. This analysis was used to determine emission reduction requirements for the SIP. Based on the TACB analysis (EKMA Diagram) for Harris County in 1987 and the estimated regional increases in refinery emissions of NO_x and VOCs, the predicted increase in O_3 formation is estimated to be 1.95 percent for the 300,000 BPD scenerio and 3.14 percent for the 450,000 BPD scenario.

The potential emission increases of heavy metals from the refining of the pipeline crude cannot be predicted because insufficient emissions data exist for these elements. The TACB refinery emissions inventory shows no lead emissions associated with the refining of crude oil.

In conclusion, sufficient protection exists for the prevention of significant deterioration of the regional air quality from refining the pipeline crude oil. The worst-case assumption that the pipeline crude would not displace existing crude oil and that emission increases as high as those predicted would occur is unrealistic. Refining volume and crude oil sources are dictated by economic and political factors. In addition, TACB limitations on refinery emissions and TACB goals to improve regional air quality resources prevents the level of emissions increases predicted in this analysis from occurring.

LETTER 56

56-36 Cont. tion alternative as defined by NEPA) and must according to CEQ regulations as well as the alternatives using tahkers, retrofitting refineries, and energy conservation.

56-37 27) 2-41, Table 2-11, if All American beats Pactex in building its pipeline what will be the economic costs to that pipeline? This is a cost of the All American Pipeline. The Pactex might bring more jobs, etc. so it might be more desirable than All American.

56-38 28) 2-42, Table 2-12, you need to give the maximum spill (worst case) and where it would occur. You need to take into account the 18.8 miles between valve locations (a liberal average) and that the first 20 miles of the pipeline after a pumping and heating station is insulated and makes the oil less viscose and increases the damage potential.

56-39 29) 2-42, Table 2-12, please show how the criteria were developed to determine which streams have important fish populations. What are the sensitive soils? Expalin the criteria used and how they were developed. You do not look at the Texas Organisation for Endangered Species lists. You should. Little is known about cave species, where they are, and how rare they are, and how vulnerable they are. You need to discuss this problem thoroughly. How was significance for county taxes decided? We also disagree with the visual, noise, and air quality impacts as we point out later in these comments.

56-40 30) 2-45, 2.7.2.1, it says, "most of the reasonable mitigation measures" have been implemented for the Edwards Aquifer crossing for the proposed alternative. Which are you referring to and which mitigation measures have not be accepted and why not?

56-41 31) 2-46, 2.7.2.3, what is the largest credible spill for the proposed and all other alternatives. Why is not spill size shown here for comparison purposes? How is credible defined here and how does this scenario compare to the CEQ regulation requirement?

56-42 32) 2-46, 2.7.2.4, why would tankers have greater air pollution and oil spill risks? Youneed to show how much of this oil will be shipped out by the ARCO marine terminal and what the possible spills are from this facilities and tankers that use it are.

56-43 33) 2-45, 2.7.2.2, you never say how you are going to reduce spill risks for the Twinn Buttes Dam.

56-44 34) 3-2, 3.2.2, you seem to downplay that there are 86 miles of shallower groundwater. Please define shallower groundwater and how many people use it. These people need protection too! On page 3-3, Table 3-1, where is the documentation for this table? Where did the information come from?

56-45 35) 3-18, Table 3-4, the flow desingations are not entirely accurate here. Although Dickinson, Halls, and Chocolate Bayou may, at some points, be intermittant, they are for most of their lengths perennial.

56-46 36) 3-20, Table 3-5, the latest Texas Water Quality Inventory has now come out and should be used to update this information in the FEIS.

56-47 37) 3-29, 3.2.4.3, there is a need to do further studies the ensure that the Caverns of Sonora are not effected or contaminated by a spill.

56-48 38) 3-30, 3.2.4.4, not all faults are mapped in the Houston area so it cannot be said that the pipeline does not corss any. Additional mapping is needed.

56-49 39) 3-32, 3.2.6.1, the fauna in all streams should be looked at.

RESPONSE TO LETTER 56

56-10 Please refer to the responses to the following specific comments: Comments 56-71, 56-72, 56-74, 56-126, 56-127, 56-128, 56-134, 56-138, 56-150, 56-151, 56-155, and 56-156. Mitigation measures have been recommended where appropriate to reduce significant impacts.

56-11 Your comment regarding substantiation of the Draft SEIS statement that the likelihood of groundwater contamination is small is noted. This Draft SEIS statement takes into account the probability of a spill, the susceptibility of an aquifer, and spill containment and cleanup considerations.

56-12 Documentation for the socioeconomic impact analysis is contained in Section 4.2.12 of the Draft SEIS. Impacts are considered minimal due to the short duration of the construction period, and the relatively small maintenance and operations workforce and infrastructure required to operate the proposed pipeline. There are no significant socioeconomic impacts related to employment, income, housing, public service demands, and recreation, except in the event of an oil spill.

56-13 Your comment concerning live oak forest impacts is noted. Live oaks however, are a major component of the woods and parks common to the Edwards Plateau and Cross Timbers and Prairies regions of Texas. Based on this abundance, construction impacts to live oaks would not be considered significant.

56-14 Celeron is a subsidiary of Goodyear. No sale has been announced at this time.

56-15 Based on your comment, Table 1-1 has been corrected and is included in the Modifications and Corrections Section 3.2.

56-16 Your comment regarding inspection and compliance is noted. Please refer to the response to Comment 6-15 and to Mitigation Measure SS-3 in Appendix A.

56-17 All issues raised during the scoping process were addressed in the impact assessment. The SEIS team objectively evaluated each issue. If they were not considered significant, they were discussed in a general way. The ranking of issues had no bearing on the addition or elimination of particular issues over others.

56-18 Our evaluation has considered not only the probability that oil will be lost, but also the overall effect on the environment and other resources in the event of a spill. Our judgement is that the resource damage from tanker spills will be greater than that from pipelines; therefore, crude oil tankers pose a greater environmental risk than pipelines. See Modifications and Corrections Section 3.3 on page 4-172 for the No Project Alternative for a discussion of tankers versus pipelines.

56-19 Remote-control valves aid in the reduction of oil spill volumes; they do not remove the risk of oil spills. Remote-control valves were recommended at locations where large volumes of oil could potentially cause significant impacts. Please refer to Mitigation Measure SS-2 in Appendix A for the most recent summary of proposed remote-control valves. An effective oil spill contingency plan is the best mitigation measure for an oil spill, refer to Appendix B of the Draft SEIS, Modifications and Corrections section for pages B-1 through B-66, and Mitigation Measure SS-1 in Appendix A of the Final SEIS.

56-20 Please refer to Tables 2-4, 2-9, and 2-10 in the Draft SEIS for specific locations proposed by AAPL for block valves.

LETTER 56

56-50 40) 3-32, 3.2.6.1, your definition of valuable for fish is not accurate. It only gives value to species which are fished for recreation or commercial importance and gives no value for those that are ecocystem important. Many smaller food fishes fall into this category. Recreational and commercially fished species relie on these for food.

56-51 41) 3-35, 3.2.6.1.5, as far as we are aware there are no native Yellow Perch in Texas.

56-52 42) 3-37, Table 3-9, gives no TOES listed species. These should also be looked at.

56-53 43) 3-39, 3.2.6.3, to say that no endangered or threatened species are known to occur in streams rossed by the proposed route is a little misleading. We realize the Concho Water Snake is covered later but it is a species that is very aquatic and depends on the Colorado and Concho Rivers for its existence.

56-54 44) 3-40, 3.2.7, again you do not refer to the Texas Organization for Endangered Species list.

56-55 45) 3-53, Table 3-13, it appears that the pipeline goes very close to several of these plant species (Jone's Selenia and Buckley tridens). It is not clear how these areas will be impacted or protected from impacts.

56-56 46) 3-55, the revised TPWD threatened and endangered species list is out now. Please use it in the FEIS.

56-57 47) 3-56, if Matagorda Bay could be affected by the pipeline crossing by an oil spill then you must look at species in Matagorda Bay. The Quinn, 1986 reference does not seem to fit into the ext as shown. Please explain. In addition on R-5 of the bibliography it is important to note that EPA has a new Water Quality Criteria book out in 1986 and this should be used in the FEIS.

56-58 48) 3-57, Table 3-14, for the Kemp's Ridley Sea Turtle deaths could also occur due to strikes by tankers or boat traffic from the ARCO marine terminal. In addition the marine terminal is a potential source of an oil spill as are the tankers it fills up and these sources of spills must be addressed in the FEIS.

56-59 49) 3-62, again contact TOES and look at their list.

56-60 50) 3-75, lead is also monitored at air quality monitoring stations.

56-61 51) 3-75, part of Harris County is also nonattainment for TSP (see page 3-79) so this statement is not entirely correct.

56-62 52) 3-81, 3.2.11.1, research activities that ranchers and farmers are undertaking should be determined now so mitigation can be devised. For instance the Bamberger Ranch raises federally listed Scimitar-Horned Oryx's, is being grown back to native grasses, and is developing a new brand of cattle.

56-63 53) 3-93, 3.2.12.3, high unemployment is also due to the agricultural recession.

56-64 54) 3-94, Table 3-26, you need to use newer vacancy rates than 1980. More vacancies are likely now due to the recession.

56-65 55) 3-96, 3.2.12.6.2, what is the cost of retrofitting refineries to handle 300,000 barrels/day and what is the long-term economic viability of this? This must be a tho-

RESPONSE TO LETTER 56

56-21 The BLM Authorized Officer will require remote-control valves at sensitive river crossings, should the oil spill contingency response crew be unable to reach the site within approximately 1-hour of notification. Where this is not feasible, a trained local responder and local storage of equipment will be required. The Emergency Response Team will have the necessary equipment to expeditiously close manual valves. Please refer to Mitigation Measures SS-2 and SS-5 in Appendix A.

56-22 Your comment regarding burying and bundling vegetation is noted. It is important to maintain the options of burying and burning vegetation removed during the clearing of the ROW. Selection of vegetation disposal procedures must be based on site-specific conditions (i.e., vegetation type, landowner's preference, and earth fill locations in relation to ROW). For example, if an oak wilt infected community is crossed, the option to burn vegetation would be used in order to minimize the potential of spreading the disease to non-infected areas. Bundling vegetative material would potentially enhance wildlife habitat in sparsely vegetated areas; however, this could be offset by the resultant increase in fire hazard potential.

56-23 Directional drilling can reduce riparian impacts at some river crossings. However, there are a number of parameters that preclude use of this relatively new technique, especially with large diameter pipelines. An engineering assessment of each river crossing is required prior to construction. Where riparian habitat must be removed because directional drilling is not feasible, this habitat will be compensated in accordance with Mitigation Measure TB-1 (see Appendix A of the Final SEIS).

No significant sedimentation impacts to aquatic resources are expected from construction. Based on available literature concerning sedimentation impacts on fish, as cited on page 4-51 Section 4.2.6.2, the effects of construction would be short-term in duration. Refer to the response to Comment 56-108 for analysis of projected sediment load increase due to construction activities. According to these calculations, sediment increase due to the project appears to be on the order of 2 to 3 percent. The aforementioned literature sources indicate that adult fish tend to move to areas with less sedimentation or remain in the area with no apparent long-term effects. They are able to handle the temporary increases in sedimentation. There also is no evidence that critical or unique spawning or nursery areas exist at or immediately downstream of the proposed pipeline crossing, based on discussions with TPWD biologists.

56-24 Your comment regarding native grasses for reclamation is noted. The reclamation seed mixture for each area along the ROW will be decided by the BLM Authorized Officer in conjunction with input from the SCS revegetation specialist and the landowners; see Mitigation Measure S-1 in Appendix A. The use of native plant species is not proposed.

56-25 Your suggestion is noted. Details of seed mixture and the use of seedlings will be made by the BLM Authorized Officer in conjunction with others (see response to Comment 56-24). We agree that seedlings may be appropriate in certain locations. Please see Mitigation Measure TB-1 for details.

56-26 The 12-inch clearance between adjacent pipelines meets DOT construction standards as specified in 49 CFR Part 195.

56-27 Additional engineering information is provided on page 2-27, Section 2.2.2.11.2, paragragh 3, lines 13-15. Protection to aquatic species from blasting will be provided by Mitigation Measure AB-4. Refer to the revised Mitigation Measures in Appendix A.

LETTER 56

roughly discussed alternative equally considered with the proposed alternative. You also need to consider a scenario where some oil is refined in California and a lesser amount shipped elsewhere. The demand that you speak of here does not seem to be here to justify this project.

56-66 56) 3-99, Table 3-30, California crude is shown to be a very poor quality grade here. After all it has 4.9% sulfur and 718ppm of metals. How will this pollution be treated and removed from the gas stream and how much will and what will be left?

56-67 57) 3-100, 3.2.12.6.3, if refining estimates are unknown with and without retrofits why is not a study done to make a determination on this? The fact is that a pipeline may not be needed. It must be pointed out that Houston does not want more SO2 and NOx emissions either, especially since we are nonattainment for ozone which NOx's help create.

56-68 58) 3-103, Table 3-33, it is misleading to say All American constructed when .... on 3-104 it says that the pipeline is nearly completed. The pipeline should be listed as under construction.

56-69 59) 3-104, 3.2.12.6.4, why should too small a pipeline like All American be built when Pactex would alleviate the need to build a second pipeline? Would not a larger pipeline generate more jobs? You need to contrast the two as alternatives. Maybe more than 300,000 barrels is justified.

56-70 60) 3-107, 3.2.12.3, it seems very odd that you do not know how much total oil will be moved by the pipeline. Why is the pipeline just competitive?

56-71 61) 3-111, 3.2.14, many Texans would dispute your assertions that the visual impacts are not generally considered to be high or that there is little of high scenic value. The very remoteness of the area will make the pipeline that much more visual and cause degradation of the resource. Your visual attribute ratings are set-up to be biased in favor of spectacular peaks, etc. and against sparely populated area. You need to define common or substantially disturbed and explain the entire visual classification system and how the criteria were developed.

56-72 62) 3-112, 3.2.15, it seems you are downplaying the effects of noise on rural or sparsely populated areas.

56-73 63) 3-165, 3.3.12.4, you need to use today's housing vacancy figures and not 1980 figures.

56-74 64) 3-166, 3.3.14, see our comments above about visual resources.

56-75 65) 3-206, Table 3-65, the Elmenforf Onion is only .1 miles south of the pipeline. How willthis area be protected?

56-76 66) 4-2, 4.2.1.1, your criteria for system safety and reliability are too vague. What is an unacceptably high risk of significant oil spill? Define. What is not? We disagree with your operating policies, etc. because they presume conformance to regulations or generally accepted industry practices make a pipeline safe. This is not necessarily true as seen by the spills and accidents we have. The location of the accident is very important. This is acknowledged on 4-2. We do not want to accept even a small risk (if it is indeed small).

56-77 67) 4-4, 4.2.1.2.1, again we ask why not remote control valves at all locations?

RESPONSE TO LETTER 56

56-28 The BLM Authorized Officer will evaluate all construction practices which may cause potential degradation of the environment such as soil erosion, protection of water bodies from debris disposal, etc.

56-29 Your comments regarding the life expectancy of foam sealant, multiple leak detection techniques, and cost of aquifer cleanup are noted. Foam sealant has an expected life of 50 to 70 years. Please refer to the Modifications and Corrections section for page 2-29 regarding foam sealants. Please refer to pages 2-31, 4-5, and 4-6 of the Draft SEIS for discussion on multiple leak detection techniques. EPA Region VI indicated dryland cleanup could range from $3,500 (100 gallon spill) to $3 million (180,000 barrel spill). The U. S. Coast Guard oil spill cleanup contractor for the Brownsville to Bay City Coastal area gave example costs of $98,000 to clean up 3,400 barrels from a marsh and $300,000 to clean up an 18 mile stretch of surface water. We estimate that aquifer cleanup costs (possibly including recovery well construction and biodegradation enhancement) could range from $100,000 to $5 million depending upon the size of the spill and the nature of the aquifer. AAPL has $20 million in liability insurance; please see the response to Comment 18-2.

56-30 Your comment on protection and mitigation measures for the Ellenburger Aquifer is noted; see also response to Comment 44-4. This section describes the agreement between AAPL and the City of Fredericksburg regarding the Ellenburger Aquifer. Please refer to Section 4.2.1.2.1 of the Draft SEIS for our evaluation of the adequacy of the proposed measures. Mitigation measures are based on the likelihood of a significant impact, the likelihood of a spill event, and the ability of standard design and Mitigation Measure SS-1 to effectively control spills and cleanup. If additional measures are deemed necessary, then a recommendation is made for a specific mitigation measure.

The DOT hydrostatic testing requirements in 49 CFR Part 195 require maintaining the pressure in the line for only four hours, so the proposed 24-hour test represents a significant improvement.

56-31 The text has been modified to reflect that the system operates unattended during normal operating conditions. Please see the Modifications and Corrections section for page 2-31.

56-32 Your comment has been noted and has been included in Mitigation Measure SS-1 as part of the Oil Spill Contingency Plan. Where one hour cannot be done, Mitigation Measure SS-2 in Appendix A also responds to this concern by requiring remote-control block valves in such areas.

56-33 Please refer to the Modifications and Corrections section for pages 4-4 and 4-20 which discusses the rationale on placement of block valves and determination of which valves require automation.

During inclement weather conditions, access to rupture sites will be executed using four-wheel drive vehicles, tracked equipment, or helicopters. Te detailed analysis of access roads has not been completed at this time and the methods of access have not been finalized.

56-34 A NPDES Permit will be required by the TWC prior to discharge of water used in the pipe for any purpose. If the pipe is to be abandoned it will be disconnected from all sources, purged of all oil and vapor with an inert material and, if left in place, the ends sealed. However, if the pipe is to be salvaged, the ROW would be restored to a similar grade as when the pipe was in place and reclaimed.

LETTER 56

56-78 68) 4-4, 4.2.1.2.1, you seem to contradict yourself here. You say that manual valves will be at major rivers and stream crossings and then you say that motor-operated valves on pipeline will be available. Which one is it?

56-79 69) 4-5, what is "a sufficient distance drom ... schools, etc. ... to provide no significant risk"? Please define. What distance?

56-80 70) 4-5, is the leak detection system the best available? Why are there not sensors at all block valves?

56-81 71) 4-7, Table 4-2, you do not show how much oil will be spilled by the time the pipeline is shutoff and the spill response team gets to the site to begin clen-up. This needs to be done.

56-82 72) 4-6, it is our contention that the fast detection system to be used over the Edwards Aquifer needs to be in place over all aquifers and stream crossings.

56-83 73) 4-8, 4.2.1.2.2, will All American have the pe sonnel watching pipe loading and unloading at the factory and too the pipeline to ensure that pipe is not damaged?

56-84 74) 4-8, 4.2.1.3, you are using data here that is from 11-18 years old. Where is recent pipeline data. You need to add the risk of spills from all components of the pipeline to give an overall estimate of spills for the entire system.

56-85 75) 4-10, 4.2.1.3.1, we feel it is arbitrary to limit spills to the 50 barrel size since cumulatively small spills can also be dangerous.

56-86 76) 4-13, you never give the total number of spills expected and the spill volumes for all the spill information that you are using. You need to use something more comprehensible for the laypersons than rate/mile/year as far as spills go.

56-87 77) 4-13, using national spill data is not good enough. The data you use is too old. You need to most up-to-date information and use Texas spill data since this deals with site specific conditions applicable to Texas.

56-88 78) 4-13, you talk alot about additional protection for the Edwards Aquifer but this is not your favored route now. Table 4-5 only lists the Edwards Aquifer protection for 6.4 miles of a 500 mile length. Your response times of 72 minutes to close a manual valve is not very assuring especially since your footnote indicates there may be longer travel times. You need to give the minimum and maximum travel times for each segment if a leak occurred and the size spill that would result. After extolling the leak detection system then you say the bigger pipeline offsets all protective measures to reduce spill volumes.

56-89 79) 4-15, if remote controlled block valves have the largest influence on reducing the spill size then we say, let's use them along the entire length of th route.

56-90 80) 4-16, the assumptions you use for maximum reasonably forseeable spill are not accurate since a two minute pump shutdown seems to quick as do closure of remote control valves. There could be a several hour travel time which means oil would spill be spilling from the pipeline in many cases.

56-91 81) 4-19, Table 4-8, it is unacceptable to have a 99.8% chance of a spill in a sensitive aquifer. More protection is also needed for agricultural lands, and endangered species.

RESPONSE TO LETTER 56

56-35 Please refer to the response to Comment 56-33 on the issue of block valves. Estimated costs for remote-control valves are provided in Mitigation Measure SS-2 (in Appendix A).

Remote-control block and check valves will be used at the Colorado River crossing to reduce potential oil spill impacts to the Concho water snake; please refer to Mitigation Measure TB-9 in Appendix A. Please refer to the response to Comment 56-6.

56-36 Your comment is noted regarding the No Project Alternative. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172. From this discussion, you will see approximately 12 pipelines are available for transport of heavy crude oil. However, to transport the heavy crude, the pipelines must either be equipped with heaters or the oil must be thinned. Most shippers prefer to ship their oil without unnecessary quality changes, particularly if the quality changes are negative. The volume proposed to be shipped by AAPL of 300,000 BPD would account for 15 to 20 percent of the total throughput capabilities of these pipelines. Because each of these common carriers has existing contracts, it would be impossible for AAPL to totally utilize one line and, thus, only have to retrofit that one pipeline for heaters and insulation. Another key factor is the age of these pipelines. The newest of these pipelines is 25 years old, and much of the equipment has experienced wear; therefore, it is not in as good condition as new equipment. If the systems are rebuilt to accommodate heated crude, it may be as expensive or more expensive than the All American Pipeline.

56-37 The Pactex Pipeline is based on the premise of shipping Alaskan North Slope crude oil. The All American Pipeline is based on the premise of shipping heavy California crude oil. Thus, they are not in direct competition with each other. It is true, however, that both pipeline companies could transport the other's product. This crossover would be difficult for Pactex since it would require diluting the heavy California crude with the lighter Alaskan crude to allow it to flow through the system. Because the pipeline companies have different goals, the economic impacts of the All American Pipeline should be minimal on the Pactex pipeline.

56-38 Catastrophic spill volumes have been provided at those areas which are particularly sensitive to an oil spill in Tables 4-9, 4-39, and 4-51 in the Draft SEIS. Please refer to the Modifications and Corrections section for page 4-20 regarding the calculation procedure for these volumes.

56-39 The criteria used to determine streams or reservoirs with important fish populations are discussed on page 3-32, Section 3.2.6.1. of the Draft SEIS. Important fish populations were defined as species being valuable in terms of recreational and commercial value and threatened or endangered status. The stream classifications of fishery resources developed by the USFWS (1984) also were used. These same criteria were applied to all alternatives.

Species on the TOES list do not have any legal protective status in Texas. However, it is important to understand that the species ranked as a high priority endangered species on the TOES list were covered by the state and federal lists.

The cave-dwelling fish and invertebrate species are discussed on page 3-39, Section 3.2.6.3, paragraph 3, and page 3-34, Section 3.3.6.3, paragraph 1 of the Draft SEIS. The data presented were from the best sources available. We acknowledge the general lack of understanding of these species' life histories and ranges, and the lack of information on oil spill transport times and routes through these subterranean aquifers.

LETTER 56

56-92 82) 4-20,define a senstive river crossing. We feel all river crossings need automatic block and check valves.

56-93 83) 4-20, what is the percent error for the model and each of the data bases it uses? Was it calibrated using real data? What were the results? How were damage estimates calculated? Do they include the costs to clean-up the environment, monitoring and the cost of restoration?

56-94 84) 4-24, 4.2.1.3.3, a study by Harrel (copy enclosed) on the effects of a crude oil spill in a small stream showed effects which lasted for over two years. This seems to contradict your assertion of quick recovery.

56-95 85) 4-25, 4.2.1.4, when oil is reomved from the pipeline to abondone it how much residual is left? We do not want to have it filled with water (nitrogen gas would be better) since there is the risk of leakage and oil contamination with water.

56-96 86) 4-25, the criteria used should not allow the introduction of any pollutants into and aquifer of any amount. You also have to consider damage to cave organisms. The water should be treated until it is clean period. When you say that, "Danger to human health is uncommon ... because concentration of contaminants necessary to cause toxic effects is greater than the threshold of the unpalatable taste and odor of hydrocarbon-contaminated water", you do not take into account chronic illness due to small sublethal doses of toxins like mutagens, teratogens, carcinogens, and nerve poisons.

56-97 87) 4-26, shallow water private drinking water wells are not taken into account. These are just as important as public wells because both concern drinking water. Deep aquifers are not necessarily less likely to be contaminate if they have faults and permeable recharge areas. We feel the effects from contamination by hydrostatic testing will not be localized since once an aquifer is contaminate the contaminant plume will continue to spread and move outward.

56-98 88) 4-28,4.2.2.3, just because no groundwater contamination from pipeline spills has been recorded does not mean that such contamination has not occurred. The techniwues to find such contamination are now better than they once were and people are only just now starting to look for contamination.

56-99 89) 4-36, 4.2.3.2, we feel all river crossings should have directional drilling for the pipeline so that no surface disturbance of the river bed occurs.

56-100 90) 4-36, 4.2.3.2, why type of treatment has to be done for hydrostatic testing water? How will metals, bacteriacides, oil and grease, and other pollutants be removed from the water before discharge.

56-101 91) 4-37, 4.2.3.3, even if the spill response teams arrive to shut off vavles in three hours it takes longer still to set up equipment and get ahead of the oil. What damage will occur to the riparian vegetation due to spill resonse, how will this damage be mitigated, and what is the full cost of replacing water that cannot be used (the permittee) must pay this full cost?

56-102 92) 4-39, the reassurances of how little oil/volume of Lake Travis is not scientific or realistic since it does not respond to the damage done to fish and wildlife in the stream leading into the lake plus it does not take basic physical charactierics of oil into account - oil in lighter than water and floats on top of it and therefore there could be no complete mixing as you suggest and the concentrations will be much greater.

RESPONSE TO LETTER 56

Your comment regarding sensitive soils is noted. Sensitive soils are soils that do not represent significant impacts but could potentially be subject to erosion and revegetation problems. (See footnote 5 on page 2-44 of the Draft SEIS.) As discussed on pages 4-47, 4-119, and 4-151, soils were considered sensitive when possessing one or more limiting characteristics (i.e., shallow soils, steep slopes, acidity, irrigated cropland, fine textured surfaces, coarse fragments, and shrink-swell potential) in relation to erosion control and revegetation.

The significance criteria for county taxes was determined based on an applicable threshold level for the entire study area. Tax base (assessed valuation) increases on an annual basis were analyzed, and the overall tax structure in Texas counties was reviewed. Based on professional evaluation, a 10 percent increase constituted a positive significant increase to the study area tax base.

Please refer to responses to Comments 56-71, 56-126, and 56-150 regarding Visual Resources, and Comments 56-72, 56-74, 56-127, 56-128, 56-134, 56-138, and 56-151 regarding Noise.

56-40 Your comment regarding reasonable mitigation measures for the Edwards Aquifer is noted. Please refer to pages 2-27 through 2-30 of the Draft SEIS. Most of the mitigation measures required for the Edwards Aquifer recharge zone crossing were stipulated to AAPL in their agreement with the Edwards Underground Water District. Additional mitigation measures required by the BLM are listed in Appendix A of the Final SEIS.

56-41 Please refer to the response to Comment 56-38 regarding spill volume calculations.

56-42 Please refer to the response to Comment 56-18 regarding relative oil spill risks of tankers and pipelines.

Air emissions from pipeline operations are limited primarily to relatively low levels of NO_x and PM emitted from the widely separated pump/heater stations. These emission rates are in the range of 200 to 300 lbs/day for NO_x and 10 to 15 lbs/day for PM. Typical harbor tanker exhaust emission rates are in the range of 400 to 600 lbs/day of NO_x and 50 to 70 lbs/day of PM for similar crude oil volume transfers.

56-43 Page B-58 of the Draft SEIS describes the preliminary oil spill response for the South Concho River upstream of Twin Buttes Reservoir.

56-44 Please see Modifications and Corrections for page 3-3 and Table 3-1. The information was provided by TWC.

56-45 Tables 3-4, 3-40, and 3-58 list the named water channels crossed by each alternative and the flow status of that channel at the crossing. At the proposed pipeline crossings, Dickinson, Halls, and Chocolate Bayous are intermittent, becoming perennial downstream of the crossing.

56-46 The summary tables of TWC Water Quality Results have been revised using the latest data. Please refer to Tables 3-5, 3-42, and 3-59 in the Modifications and Corrections section.

56-47 There is no feasible method to mitigate potential oil spill impacts to the Caverns of Sonora other than a site-specific Oil Spill Contingency Plan (see Modifications and Corrections section for Table B4-1a).

LETTER 56

56-103 93) 4-42, 4.2.4, the criteria you use here are subjective and not quantifiable. Please quantify your criteria and tell where your criteria came from.

56-104 94) 4-43, 4.2.4.2.1, more detailed information is needed about the Caverns of Sonora. There may be various underground linkages which would lead to the caverns.

56-105 95) 4-45, 4.2.4.3.3, groundwater pumping restrictions by HGCSD have reduced subsidence in East Harris County but not in West Harris County where subsidence is increasing. In addition faults are not fully mapped along the pipeline ROW in this area.

56-106 96) 4-46,.4.2.5.1, please define what successful rehavilitation is (%cover, what type of species, etc.)? Your criteria are not spelled out.

56-107 97) 4-50, 4.2.5.3, Alberta Canada is considerably cooler than Texas. This is not a worst case scenario. You need to have a break in the middle of summer along the insulated portion of the pipeline. How much would the acreage impacted increase in the higher clay content soils.

56-108 98) 4-52, how will sedimentation impacts be reduced? We think silt curtains should be required. However the best idea is to directionally drill under rivers so no disturbance occurs.

56-109 99) 4-54, 4.2.6.3, Harrel's study showed a greater than two year effect on the benthos (copy enclosed).

56-110 100) 4-54, you give nothing on cave species and the impacts a spill would have. Oil spills in coastal marshes can last much longer than three years. The spill in the West Falmouth area in Massachusetts as reported on by Teal and others over the years has demonstrated this.

56-111 101) 4-55, Table 4-16, it is important to note that many species have no toxicity data and especially chronic toxicity data is missing.

56-112 102) 4-60, again explain what adequate groud cover it. In addition you must utilize criteria that also focus on nongame species and ecosystem values and not simply game species. You criteria for impacting endangered species in not quantitative.

56-113 103) 4-61, 4.2.7.2, how will you keep construction crews from harrassing wildlife? How will you mitigate for woodlands destroyed?

56-114 104) 4-67, 4.2.7.3.1, it is not clear how you will mitigate endangered species habitats, both state, federal, and TOES listed species.

56-115 105) 4-67, you say there is a remote chance that an oil spill will effect San Marcos Salamanders. Please quantify.

56-116 106) 4-68, considering how hard it is to find any juvenile turtles, six in five years is quite remarkable. Galveston Bay may be more important than you think. We do not know. You should not assume these turtle finds are not significant. What does remote here mean?

56-117 107) 4-73 & 74, 4.2.10, We are not aware of any secondary standards for O3, NO2, or CO. In addition you do not list lead as an air pollutant with a NAAQS. Metals will also be emitted as will toxic organic compounds by the pipeline and the refining of the crude.

56-118 108) 4-75, Table 4-20 and 4-21, you need to give the total amount of each pollutant gen-

RESPONSE TO LETTER 56

56-48 Faults in the Houston-Galveston area are generally very difficult to map. This is due to a number of factors: 1) well-defined fault scarps are limited in number, 2) faults are difficult to recognize in the type of unconsolidated sediments found in the area, 3) geophysical logging and seismic data cannot detect minor fault movements in complex and discontinuous Pleistocene sediments, and 4) adequate marker beds with which to trace fault movement are not present. For these reasons, these faults are generally not mapped except where surface expressions can be documented by damage to road-beds, railroads, buildings, and other man-made structures. Fault traces are extrapolated or extended by the use of aerial photos where linear features can be mapped by color or tonal changes and distinctive drainage patterns. The pipeline does not cross any known active fault zones, although it does cross numerous lineaments and extrapolated fault zones (see 3.2.4.4, page 3-29 of the Draft SEIS).

Faulting would only be activated by extensive groundwater pumping and the resultant lowering of the piezometric surface (groundwater table). The pipeline passes south of the area of maximum subsidence in the Houston area. Near Texas City and the pipeline terminus, ground subsidence had been a serious problem until the Harris-Galveston Coastal Subsidence District established the 1976 District Plan.

Through reductions in groundwater pumping from 1978 to 1983, subsidence rates in the Texas City area have been dramatically reduced. Because fault movement rates depend on pumping rates and subsequent lowering of the piezometric surface, future conservation and shifting of water use from groundwater to other sources suggest that fault movement will be minimal during the project lifetime. Even if pumping were to continue at higher than anticipated rates, subsidence and gradual fault movement would not cause catastrophic failure of the pipeline.

56-49 It is recognized that other aquatic resources occur in these water bodies. All fish fauna known to occur in water bodies downstream of the pipeline crossings are listed in Appendix E, Tables E1-1, E1-4, E1-5, E1-6, and E1-7 in the Draft SEIS. However, due to the large number of species in the study areas, the assessment emphasized those species that are considered important in terms of recreational, commercial, or threatened or endangered status. The data base was adequate to complete impact assessment.

56-50 It is recognized that other fish species are considered valuable to recreational and commercial fish species as food sources. However, in many instances, the forage fish populations are rather diverse and large. It is our professional judgement that potential impacts to the forage fish populations by the All American Pipeline would not jeopardize the existence of recreational, commercial, or threatened and endangered fish species.

56-51 According to Hubbs (1982), yellow perch have been introduced into some Texas rivers.

56-52 The comment regarding the TOES listed species is noted; please refer to the response to Comment 56-39.

56-53 Although many amphibian species use aquatic environments, this group was covered by the terrestrial biology discipline. To avoid confusion, please refer to the Modifications and Corrections section for page 3-39.

56-54 Please refer to the response to Comment 56-39.

LETTER 56

56-118 Cont. erated during the entire construction period. Otherwise these emission factors mean nothing to the average person.

56-119 109) 4-76, how will workers be affected by temporary TSP and CO exceedances? How will these high concentrations be mitigated? You need to show the tons/yr. added by construction.

56-120 110) 4-79, 4.2.10.3, the ARCO marine terminal will also generate operational emissions which need to be quantified. You also need to show the emissions generated from start-ups, shut-downs, emergency upsets and their potential effects. It is not just the maximum annual concentration you have to worry about but also upsets which release tremendous amounts of emissions and which occur regularly.

56-121 111) 4-84, we disagree that fugitive hydrocarbons from transfer and storage systems are localized. These emissions help form ozone, a regional pollutant, which is usually created at its highest concentration, downwind and away from the sources of hydrocarbons and nitrogen oxides. Again you do not include increased metal emissions from refineries and you do not address a Sierra Club concern identified in the scoping - ozone. This is the largest problem facing us currently in the Houston Area airshed. Yet do not even address it.

You never say how much extra high sulfer crude will be refined in addition to other high sulfer crudes that comes from other countires. Just because high sulfer crudes are already refined here is not an excuse for additional high sulfer oil from All American. What percentage of refinery capcity is used now and what percentage of this is used to refine high sulfer crude and what are the predictions for these two figures in the future? Other pollutants that need to be looked at from refineries are TSP, lead, metals, and VOC's.

56-122 112) 4-89, you totally ignore Houston's ozone problem. We are nonattainment for ozone and hydrocarbons and nitrogen oxides form to cuase ozone. We need to reduce emissions and not increase them by 3.0% for NOX's and an unknown amount for hydrocarbons. This is a significant increase in NOx's and sulfer (6.1%) for our area. Where is the mitigation for this? Your assertion that acid rain is not a problem in our area ignores that rains with ph's in the threes have occurred in the Houston area. This section on air quality has been very poorly done.

56-123 113) 4-90, how was the 1% and 5% criteria decided? What documentation supports this?

56-124 114) 4-93, how was the criteria developed for cocioeconomics (25% change in infrastructure)?

56-125 115) 4-103, 4.2.13.2, if the applicant can bore under roairoad tracks then it can srely bore under streams which need for protection. In addition there is no mention of possible road damage when heavy equipment crosses the roads. How will this be mitigated? How will the applicant ensure that the 335 cars are parked in the ROW and not outside adding to environmental damage? What will happen if such offsite parking cannot be guaranteed? What mitigation is required?

56-126 116) 4-105, 4.2.14.2, explain what common scenic quality of the site vicinity means. This could be said about any area (doesn't Yosemite have numerous falls and mountains). The low number of viewers does not make a visually unacceptable contrast any more acceptable.

RESPONSE TO LETTER 56

56-55 Please refer to Mitigation Measures TB-1 and TB-12 in Appendix A. The clearance of the route by a qualified botantist ahead of the construction spread will allow for the identification of sensitive plant species within the ROW. If these species are encountered, mitigation measures such as transplanting, ROW width reduction, or minor realignment will be evaluated by the BLM Authorized Officer.

56-56 Your comment regarding the new TPWD list (March 1987) of endangered species is noted. The Draft SEIS was prepared prior to the release of the new list. Please refer to the response to Comment 52-9.

56-57 The Quinn 1986 reference is correct as stated. Matagorda Bay could be affected by an oil spill; however, due to the remote chances of a spill, the presence of block and check valves, and because it would take 26.5 hours for oil to reach the Bay in a spring storm event (106 miles) and the oil would likely be contained before reaching this point, a detailed evaluation of resources potentially affected was not done. More detailed impacts were assessed for Galveston Bay when oil spill transport times were less than 10 hours in a spring storm event.

56-58 We agree that Kemp's (Atlantic) Ridley sea turtles could be killed by colliding with tankers; however, the chances of this are remote, and no quantitative data are available from the literature to support any impact projections. The potential impact from existing tankers, freighters, and sport fishing boats is probably far greater. Turtles could be impacted by spills at the terminal.

56-59 Please refer to the responses to Comments 52-4 and 52-9.

56-60 Please refer to the Modifications and Corrections section for page 3-75.

56-61 Please refer to the Modifications and Corrections section for page 3-75.

56-62 The question of mitigation for research activities being conducted on lands crossed by the pipeline would be negotiated between AAPL and the landowner during purchase of the easement. Please also see Mitigation Measure LU-3.

56-63 Your comment is noted and the correction has been incorporated into the Modifications and Corrections section for page 3-93.

56-64 Housing statistics are not readily available for rural areas throughout the State of Texas; therefore, the most consistent figures available were the 1980 census figures. The increased availability of housing due to out-of-state migration of Texas residents would improve the housing condition for temporary workers locating in the area during construction.

56-65 Your comment regarding supply and demand is noted. Please refer to the response to Comment 56-1.

56-66 Your comment regarding emissions from refining project crude is noted. Please refer to the response to Comment 56-9.

56-67 Your comment regarding emissions from refining project crude is noted. Please refer to the response to Comment 56-9.

56-68 The pipeline is constructed and is presently undergoing its final operation tests.

LETTER 56

56-127 117) 4-106, 4.2.15.1, these criteria should also be used if the noise intrudes into a low noise area because the impacts of extra noise will be more noticeable where the noise baseline is very low.

56-128 118) 4-107, there is no real noise mitigation for construction since 70 decibels is the level where noise begins to have physicalimpacts on humans. You need to use mufflers on construction equipment, noise absorbers, and other mitigation to get the levels down to acceptable decibel limits. There is no indication on what mitigation will be done for the two residences within the 65 decibel noise zone.

56-129 119) 4-118, it is not clear whether you will avoid coal fields, oil and gas wells, sulfer mines, and gravel pits or not. Please state what you will do. In addition you need to commit to alignment changes to reduce impacts at rivers.

56-130 120) 4-125, 4.3.6.1, we do not belive that, "fuel spills would not likely measurably reduce the numbers of important fish species, impacts would be considered insignificant". Using weasel words will not reassure that impacts will not occur and be significant.

56-131 121) 4-125, 4.3.7.1, it is not clear what will be done to completely mitigate the loss of 120 acres of riparian vegetation and losses of oak-mesquite-juniper and post oak areas.

56-132 122) 4-127, 4.3.7.1.1, so how will you mitigate for the Concho Water Snake? There is no real mitigation given except to say that the alignment could be modified to reduce impacts on the species but you do not say how this will be done. You need to drill under the Colorado River to avoid impacts.

56-133 123) 4-129, 4.3.7.2.1, you give no indication of how you can reduce spill impacts on the Concho Water Snake. A spill could destroy the snake below this area and along with Stacy Dam could cumulatively lead to the snakes extinction.

56-134 124) 4-139, again how will the noise levels be mitigated completely for construction and operation?

56-135 125) 4-147, 4.4.3.2, how will you reduce the response time to a spill on the Devil's River? What mitigation will you do here?

56-136 126) 4-159, 4.4.7.1.1, if plant populations are crossed what will be done to mitigate? We also are concerned about the impacts on the Attwater's Prairie Chicken. The mitigation does not appear to be thoroughly though out. How can the alignment be changed to avoid these birds?

56-137 127) 4-166, you should be able to quantify recreational impacts. What are the costs due to this pipeline?

56-138 128) 4-172, what will be done about noise form consturction, operation, and abandonment?

56-139 129) 4-172, 4.5, you do not give equal indepth consideration to the no action alternative which is not a no action alternative at all. Energy conservation should also be an alternative. Since earlier you claimed you did not have figures for retrofits how can you now claim that they are not liely to be economically feasible. You need a complete economic and environmental analysis to see how feasible they are. You need to show what leakage figures are like for existing Texas pipelines. It seems like you are saying these existing lines are too old and therefore are not very safe. What information do you base this assertion on?

RESPONSE TO LETTER 56

56-69 Please refer to the response to Comment 56-1. A number of experts have predicted various volume estimates of surplus crude on the West Coast. The need for Pactex and AAPL to transport crude to the Gulf Coast is based on the demand in the eastern U.S. AAPL believes heavy California crude can be competitive in displacing Venezuelan and Mexican crude, thus, filling the existing demand. The Pactex pipeline is based on shipment of Alaskan North Slope crude that is currently being shipped by tankers. Pactex may also displace foreign crude with ANS in PADD 3. Thus, each project promoter may independently proceed with their own project. It is unlikely the two projects could be combined into one, based on the fact that heavy crude requires heating to enable shipping without blending. Blending would be a detractant because it would reduce high quality crude oil, which most shippers would not desire. California heavy crude is valued at $8 to $10 per barrel and ANS at $18 to $20 per barrel. The price of a blend would be closer to the heavy crude regardless of the proportions of the heavy and light crudes.

56-70 The All American Pipeline would compete with tankers. Existing tankers ship oil at a cost of about $4.00 per barrel; however, tanker costs are likely to increase due to tanker replacement, increased labor costs, and other changing variables. The proposed pipeline costs are based on fewer changing variables. The pipeline project is based on 1985 through 1988 dollars versus future dollars for tankers, and the long-term labor commitment for pipeline operation would be low.

56-71 The visual analysis system is outlined on page 3-107 of the Draft SEIS; more detail is available to the interested reader in sections of the BLM Manual cited on the same page. The methodology used is standard for BLM visual analyses and was developed to provide an objective, consistent, repeatable approach to an inherently qualitative issue. Use of standard terms such as "common" and "substantially disturbed" is not intended to be derogatory; they merely indicate respectively that the landscape in question is not unique or rare in the vicinity and that, as in the case of farmland, the landscape is no longer in its natural state.

56-72 Noise sensitive receptors are noted. Disturbance to a cluster of 50 homes is commonly considered more notable than disturbance to a single home. Because of the very short-term nature of pipeline construction noise, identification of individual sensitive receptors away from pump station sites was not warranted.

56-73 Please refer to the response to Comment 56-64.

56-74 Please refer to the response to Comment 56-71.

56-75 Please refer to the response to Comment 56-55.

56-76 Please refer to the significance criteria in each of the specific environmental disciplines regarding the acceptable risk of an oil spill. Mitigation Measure SS-3 (in Appendix A) is designed to provide conformance of the pipeline design, construction, and operating practices to applicable codes, regulations, etc. Your comment on the level of acceptable risk is noted.

56-77 Please refer to the Modifications and Corrections section for pages 4-4 and 4-20.

LETTER 56

56-140 130) 4-174, you say that tankers have a greater risk of oil loss and increased air pollution. Please document this statement. In addition you do not calculate or discuss the impacts on the Pactex Pipeline that building All-American would have. The cumulative impacts of projects, like Pactex, Stacy, and other pipelines on the Concho Water Snake and other environmental factors have not been considered.

56-141 131) 4-174, if mitigation is not spelled out in the Record of Decision then it will be very difficult to force All American to do mitigation. An authorized officer must be designated to ensure complete compliance with the ROD and any agreements or other documents signed.

56-142 132) 4-175, 4.7.1, there is a need for remote controlled block and check valves at all valve locations and at all stream corssings.

56-143 133) 4-176, Table 4-62, you give no indication here about moximum terrestrial spills and you do not include enough river for possible spill scenarios.

56-144 134) 4-180, GW-4, we oppose any groundwater classification system which would write off a source of groundwater as being an acceptable place to pollute.

56-145 135) 4-181, G-3, we agree that using trench excavation within two miles of the Caverns of Sonora must be done. G-4, we also agree with rerouting around mineral extraction area. G-5, how long will the polyurethan sealant last in open country? Will it last the life of the pipeline (40 years)? If it will not last 40 years what additional mitigation will be done? Is that two mile either side of the Caverns of Sonora or one mile on either side?

56-146 136) 4-182, AB-1, this mitigation measure must also apply to intermittant streams.

56-147 137) 4-184,.TB-5, you need to show where all the wildlife corridors are and what are the impacts of locating booms near sensitive communities? TB-11, when will surveys for Black-Capped Mireos be done? It must be during the breeding season. TB-12, what other mitigation measures will be used if plant species are located? TB-15, while replanting riparians areas is good there should be a two to one creation since our restoration abilities are not documented to be as good as Nature's. Buying good riparian areas should also be an option.

56-148 138) 4-192, 4.7.10, you need air quality mitigation as we pointed out in our ealier comments. The ozone problem must not be worsened.

56-149 139) 4-193, 4.7.1.3, you have nomitigation for damaged roads. This is needed.

56-150 140) 4-193, 4.7.14, VR-1, this needs to be done at all stream crossings. You also need to plant trees nearby.

56-151 141) 4-194, 4.7.1.5, your noise mitigation for construction is inaccetable. It puts people at risk. N-1, you need to commit to tree buffering and other noise reduction techniques.

56-152 142) 4-194, 4.7.16, O-1, why not plant native grasses, and leave bundles of cut vegetation for wildlife on state lands and offer to do this on private lands. Quail and other species will benefit.

56-153 143) Table 4-63, the riparian impact is still significant under construction for terrestrial biology.

RESPONSE TO LETTER 56

56-78 AAPL proposed manual valves and BLM proposed motor-operated valves. Please check the Modifications and Corrections section for a revised Mitigation Measure SS-5 (in Appendix A) for this issue.

56-79 A minimum separation distance of 0.5 mile for pump/heater stations has been specified in Mitigation Measure SS-9 in Appendix A.

56-80 The sensitivity of the leak detection system (see Revised Table 4-2 in the Modifications and Corrections section) puts this system in the range of modern crude oil pipelines and in excess of leak detection systems found on many older pipelines.

56-81 The requested data is shown in Tables 4-9, 4-39, and 4-51 of the Draft SEIS.

56-82 The leak detection system proposed for most of the route meets criteria expected of modern crude oil pipelines and exceeds that which exists on many older pipelines. AAPL has proposed several enhancements over the Edwards Aquifer recharge zone to increase the sensitivity of the system, but we see no particular need to require the increased detection sensitivity over the pipeline as a whole. Please refer to the responses to Comments 44-4 and 56-19.

56-83 AAPL did routinely observe pipe handling at the factory. AAPL representatives do inspect the pipe when it arrives on-site.

56-84 Please refer to the Modifications and Corrections section for page 4-10 regarding the justification of the historical data base on spill frequency used in the analysis. Pipeline spills are by far the greatest risk as indicated by the historical data given on page 4-9 of the Draft SEIS.

56-85 The historical data base is limited to spills sized 50 bbl and greater. Smaller spills are not required to be reported to the DOT. We cannot reliably estimate the frequency of spills less than 50 bbl.

56-86 Please refer to Tables 4-7, 4-37, and 4-49 in the Draft SEIS for this information.

56-87 Please refer to the Corrections and Modifications section for page 4-10 for additional explanations regarding the use of national spill statistics. Updated spill data are also given in Table 4-3A in the Modifications and Corrections section.

56-88 Travel times to close block valves and initiate responses for critical receptors along each alternative are given in Tables 4-9, 4-39, and 4-50 in the Draft SEIS.

56-89 Please refer to the Modifications and Corrections section for pages 4-4 and 4-20 which discusses the procedures used to select locations for remote-control block valves. Please refer to response to Comment 56-19.

56-90 Our experience is that the assumptions used in making the spill estimates are reasonable for modern crude oil pipelines. Travel times for valve closure were based on the leak location relative to the nearest AAPL maintenance center.

56-91 Your comment regarding the 99.8 percent chance of a spill in a sensitive aquifer as being unacceptable is noted. However, the likelihood of aquifer contamination is not this high; see impact summaries in Modifications and Corrections Section 3.4.

LETTER 56

56-154 144) 4-200, Table 4-63, financial compensation for losses in creation due to spills under land use and recreation needs to be guranteed.

56-155 145) 4-201, Table 4-63,.noise construction is unacceptable due to noise levels during abondonement. No mitigation is shown for the supposed no action alternative and no impacts are shown for that alternative. This is against CEQ regulations.

56-156 146) 4-212, Table 4-66, there will be irretrievable and irreversible impacts to air, noise, visual resources, etc. as we have enumerated in these comments.

Specific Comments on Appendices

56-157 1) A-4, where did the spill statistics come from concerning external corrosion?

56-158 2) B-1, what will be the procedure for updating the spill contingency plan? How often will this occur and will there be public input for these revisions?

56-159 3) B-3, Figure B2-1, under support delete men and add personnel.

56-160 4) B-8, 2.2.5, satisfactorily should be deleted. This is a weasel word.

56-161 5) B-51, there is no mention of using microorganisms to clean-up oil spills Why?

56-162 6) B-52, there needs to be post monitoring of restoration to determine the success or failure of efforts. If efforts are not successful then additional mitigation is needed.

56-163 7) B-57, on all of these maps you need to have equipment locations now. Especially important are the Concho Water Snake and Twin Buttes areas. They are very vulnerable.

56-164 8) C-6, it is fallacious to say no deleterious health effects would occur if water was contaminated with hydrocarbons. You are not taking into account the carcinogens, mutagens, and terotogens, and other chronic or sublethal effects.

56-165 9) E2-1, you need to discuss TOES listed species.

56-166 10) E2-1, here you say there are no special status invertebrates. Yet the US Fish and Wildlife Service have been collecting information about possible candidate species which are cave invertebrates in Travis County. These species and others unknown may exist along the pipeline and a complete flora and fauna investigation needs to be done for the caves and karst features along all proposed routes.

56-167 11) E2-2, concerning Ridley turtles there were a great many strandings in 1986. Please check with US Fish & Wildlife about this (Jack Woody in the Albuquerque office). In addition it is inaccurate to infer since young ridleys move to open water that their presence is rare in bays.. We do not know where the young go and it is far too premature to claim they do not need the bays when the bays are the most protected and likely spots that might be used.

56-168 12) E2-29, it is never clear how you will mitigate the loss of 314-1510 acres of Golden Cheeked Warbler habitat. Will there be creation or habitat set asides?

56-169 13) E3-8, we need to see an oil spill contingency plan that is site specific now.

56-170 14) F-2, Table F-1, please check your secondary standards. We believe some of these have been dropped or do not exist.

RESPONSE TO LETTER 56

Please refer to Mitigation Measure SS-2 (in Appendix A) for a list of the river crossings which require remote-control block valves, and Mitigation Measure SS-1 (in Appendix A) for oil spill contingency plan requirements.

56-93 Please refer to Modifications and Corrections section for page 4-20 regarding procedures used to estimate spill volumes at sensitive locations. Damage estimates were taken from statistical data and represent the damages reported to DOT on the spill reports. DOT requires damage estimates to pipeline equipment itself as well as property belonging to outside parties.

56-94 Your comment involving the duration of impacts on freshwater and marine aquatic environments from oil spills was reviewed. A review of additional literature indicated that recovery times can be greater than three years. Please refer to the Modifications and Corrections section for pages 4-54, 4-57, 4-125, and 4-157 concerning the range of recovery times in freshwater and marine environments.

56-95 The proposed line abandonment practices are consistent with standard industry practice. Nitrogen gas, although acceptable to DOT because it is inert, poses potential safety problems should the gas in the pipeline become pressurized (e.g., from excessive heat). Liquids, such as water, are relatively incompressible and are not subject to pressurization.

56-96 The part of this comment dealing with consideration of potential damage to cave organisms has been reviewed. The occurrence and potential impacts to cave-dwelling invertebrates have been discussed in Section 3.2.6.3 on page 3-39 and Section 4.2.6.3 on pages 4-54 and 4-57 of the Draft SEIS.

Your comment regarding hydrocarbon constituents and impacts on human health is noted. Please refer to Appendix A, Sections 1.1 and 1.4 in the Modifications and Corrections section of the Final SEIS.

56-97 Your comment regarding shallow wells is noted. Please refer to Mitigation Measures GW-1 and GW-3 in Appendix A.

56-98 Your comment regarding groundwater contamination from pipeline spills is noted. Please refer to the response to Comment 22-3.

56-99 Please refer to the responses to Comments 56-23, 56-108, and 68-5 for a discussion of sedimentation impacts.

56-100 Hydrostatic testing would be performed after construction and before the line is placed in service. The hydrostatic test would be conducted in accordance with requirements of DOT, Office of Pipeline Safety. The hydrostatic test involves filling the line with fresh water, increasing the pressure by means of a special pump, and pressurizing the test sections until a predetermined internal pressure is achieved. This pressure would be at least 125 percent of the pipeline operating design pressure for 24 hours. Such tests are designed to prove that the pipe, fittings, and weld sections would maintain mechanical integrity without failure or leakage under pressure.

The estimated amount of water required for testing the pipeline would be 100 acre-feet per spread. Water for testing would be obtained from private sources (e.g., major rivers and reservoirs) or from city, county, or state agencies. Prior to testing, all water would be analyzed for corrosive chemicals or other substances potentially harmful to the pipe interior.

LETTER 56

56-171 15) F-4, you state air pollution is minimal but you do not talk about this projects' contribution to ozone air pollution in one of the worst ozone nonattainment areas in the country. In addition you do not discuss toxic hydrocarbon, metal, TSP, and lead contributions from this project.

Specific Comments on the Biological Assessment

We reject the contention by the BLM that the BA is not a part of the EIS process. The BA is used to make certain assumptions, analysis, or assessments in the EIS and therefore is indeed and important appendix and accessory document for the EIS and needs to be commented on. Since the BA is used to justify portions of the EIS it is only fair to allow commenters on the EIS to comment on the BA also.

1) 1-1, here you contradict your appendices, E2-1, when you state that several candidate invertebrates are present in the project area. Please explain and correct the EIS.

2) 1-2, field surveys and results and proposed mitigation should be done now for the EIS to let reviewers comment on what is proposed (full disclosure).

3) 2-1, this is not an additional segment but is part of the original project. You cannot legally under NEPA and CEQ regulations segment a project.

4) 3-1, what information do you have to base saying oil will not kill the root system of wild rice? Hurting the reproduction of wild rice could be extremely serious.

5) 3-4, All American should commit to a transplant program now.

6) 3-5, the population estimate for the Fountain Darter is 12 years old. A newer one is needed.

7) 3-9, the draft oil spill contingency plan is needed now so the public can review and comment on it.

8) 3-13, it is not logical to assume the San Marcos Gambusia has the same acute toxicity concentration level as other Gambusia species. Since it has very specialized habitat requirements it may differe from other species in other ways. In addition there is no chronic toxicity tests that have been done.

9) 3-15, wherever it is thought that All American is going to affect an endangered species' population there should be a commitment to captive breeding and transplanting efforts.

10) 3-24, surveys for species should be done now so the results can be commented on in the FEIS.

11) 3-29, there is no mention of the Texas City marine terminal and how a spill here might affect sea turtles.

12) 3-31, it is the Sierra Club's position that the population of Concho Water Snakes is so threatened at present (Stacy Dam, etc.) that the loss of one individual is critical. How will losses be mitigated? 3-34, the US Fish and Wildlife Service has caved in with a politically inspired biological opinion and is no longer aginst Stacy Dam.

RESPONSE TO LETTER 56

Impacts to surface water resources caused by the discharge of hydrostatic test water would not be significant. During hydrostatic testing, the water would pick up rust, metal fragments, welding slag, oil and grease, bactericides, and some mud. The water would be tested and treated, if necessary, before being released in accordance with applicable regulations (i.e., NPDES permit conditions). NPDES permits are issued and regulated by the TWC. Discharge limits and concentrations are defined in the NPDES permit on an individual basis. The water would be released in a controlled manner so that natural waterways would not be degraded. Similar discharges from any possible dewatering operations would be treated to conform to acceptable effluent limitations. If suspended solids are a problem, the water would be impounded to allow settling prior to being released. No hazardous wastes are planned to be generated during construction. However, should hazardous waste be generated, it will be regulated by the Hazardous Waste Division of the TWC.

56-101 The Oil Spill Contingency Plan is being developed under the stipulation of a 1-hour response time from the time of notification for sensitive areas; see Appendix B in the Draft SEIS and Modifications and Corrections Section 3.3 to Appendix B in the Final SEIS. Lost riparian habitat will be restored and the costs for replacement water will be fully compensated for by AAPL for impacts due to the All American Pipeline.

It is difficult to predict impacts to vegetation resulting from spill response due to the unlimited number of possible scenarios. However, any disturbance to vegetation, including riparian, as a result of cleanup activities would be restored through vacuuming, high pressure rinsing, and if appropriate, removal and reclamation, recovery is normally a few months to two years.

56-102 Please refer to the response to Comment 6-4.

56-103 Your comment regarding significance criteria is noted. Criteria were developed specifically for this EIS. Significance is related to: 1) the likelihood of an impact event taking place, 2) the sensitivity of the resource, and 3) the magnitude and importance of the impact.

56-104 Your comment regarding potential contamination of the Caverns of Sonora is noted. Please refer to the response to Comment 56-47.

56-105 Your comment regarding the crossing of faults by the proposed pipeline route is noted. Please refer to the response to Comment 56-48.

56-106 Successful rehabilitation, as discussed in Section 4.2.5.1, is the stabilization of soils with respect to erosion within one year following erosion control and revegetation of disturbed areas. The goal is to stabilize the disturbed areas and minimize erosion. Percent cover and species mix would depend on site-specific conditions (i.e., soil type, topography, vegetation type, moisture conditions) and private landowners' requests.

56-107 The oil spills used as examples of spill volume and associated size were from Canada and Texas. We believe that the information presented in the text is comparable to what would be expected for the All American Pipeline.

56-108 The BLM Authorized Officer reviews construction practices in the field to ensure unnecessary environmental impacts do not occur. In the case of sedimentation and sediment transport the likely impacts of unrestricted construction are low. Please review the following analysis of sediment generated by construction.

LETTER 56

The effect of the pipeline will be greater than what is portrayed since there will be few snakes to repopulate becasue the Stacy Dam will have destroyed and fragmented the population.

13) 3-44, what are the results of the January 1987 nest location and activity survey for bald eagles?

14) 3-58, better mitigation is needed for Attwater's Prairie Cheicken. This species is critically endangered now. Perhaps the ROW can be turned into habitat for this bird. Additional lands should be sought for expansion of the refuge.

RESPONSE TO LETTER 56

A discussion of sediment loading due to construction has been added to Modifications and Corrections Section 3.3 for page 4-36. Please also refer to response to Comments 56-23 and 45-125 for a discussion of directional drilling.

56-109 The study by Harrel (1984) is incorporated into the impact discussion. Please refer to the Modifications and Corrections section for page 4-54, paragraph 1.

56-110 Potential oil spill impacts on cave-dwelling fish and invertebrate species are discussed on page 4-57, Section 4.2.6.3, paragraph 1, lines 2 and 3 in the Draft SEIS (reference to the species is also made on page 3-37, Table 3-9).

The comment concerning recovery time for coastal marshes is noted. Please refer to the Modifications and Corrections section for page 4-57.

56-111 The comment regarding limited toxicity information is noted; please refer to the Modifications and Corrections section for page 4-54, paragraph 3.

56-112 Please refer to the response to Comment 56-106. In addition to soil stabilization, adequate cover would include plant species composition consistent with future land uses such as grazing, agricultural development, or wildlife habitat.

The significance criteria for threatened or endangered species is as quantitative as practical; any impact is considered significant.

56-113 Mitigation Measure TB-2 prohibits vehicle use outside of the ROW by construction workers. In addition the BLM Authorized Officer will report any illegal use of firearms to the appropriate officials.

Your comment regarding woodlands is noted. Impacts to woodlands, excluding riparian woodlands, are not identified as a significant impact. Please refer to Section 4.2.7.1 in the Draft SEIS, which lists the significance criteria.

56-114 Your comment regarding endangered species is noted. Mitigation Measures TB-1, TB-4, TB-5, and TB-8 through TB-14 address federal and state endangered species of legal status. Please see the Biological Opinion in Appendix C. Please refer to the response to Comment 52-9 for a discussion of the TOES list.

56-115 Based on existing data, there is a remote possibility that oil could reach the Edwards Aquifer or San Marcos Springs. However, quantitative impact projections are not possible since little data exists on oil toxicity to salamanders and the estimation of toxic oil fractions cannot be done technically.

56-116 Based on the low number of turtle recoveries in Galveston Bay and the low oil spill potential, the chances are minimal that turtles would be oiled, or that the population would be affected. The recoveries near Padre Island are greater, indicating the probability that more turtles are in this area than in the Galveston area. Other industry sources of oil and chemicals are a much greater threat to Galveston Bay. In general, the oil supplied by AAPL would replace other oils, not cause an increase.

56-117 The secondary NAAQS for O_3, NO_2, and CO are currently set at the same level as the primary standards. Please refer to Table F-1 in the Modifications and Corrections section.

Please refer to the Modifications and Corrections section for page 4-74; lead has been added to this discussion.

Metals and toxic organic compounds will not be emitted by the pipeline. Your comment regarding refinery emissions is noted; please refer to the response to Comment 56-9.

56-118 Your comment regarding pipeline construction emission factors is noted. The emission factors used for the construction inventory were from EPA reference guidelines. Treating construction emissions over the entire pipeline length cumulatively is inappropriate since these emissions are temporary and transient.

56-119 Your comment regarding construction emission impacts is noted. Construction workers are not expected to be exposed to levels of CO and TSP which exceed NAAQS. The parallel wind scenario is a rare catastrophic situation expected to happen very infrequently. Since the pipeline will be constructed in a relatively rural setting, the assumption of a high background CO level is unrealistic. Actual background CO levels, when combined with construction emissions, will be below NAAQS for CO. In addition, workers are protected from adverse exposure to potential health threatening situations by OSHA standards which will be in effect during pipeline construction.

Fugitive dust emissions computed for the pipeline construction are common to construction sites and are not unexpected. Control of these emissions will be ensured by the BLM Authorized Officer and will include extensive water spraying. CO emissions will be minimized by keeping equipment well maintained and in good operational order. These emissions are also common to construction sites.

Since construction emissions are temporary and transient, expressing those emissions in units of tons per year is inappropriate. Pipeline construction emissions are not cumulative nor do they persist at a location for more than a period of days. Please refer to Table 4-20, page 4-75 of the Draft SEIS for estimated pipeline emissions.

56-120 Your comment regarding marine terminal operational emissions is noted. The emissions associated with fugitive VOC emissions are strictly regulated by the TACB in their SIP. Since there are insufficient data which specifically define the destination of the pipeline crude after it reaches the transfer and storage facilities, estimation of the potential ARCO marine terminal operational emissions is impossible.

56-121 Please refer to the response to Comment 56-9.

56-122 Your comment regarding Houston air quality is noted. Please refer to the response to Comment 56-9 which addresses these air quality issues.

The second part to your comment regarding acid rain impacts is noted. The analysis of potential acid deposition from refineries in the region is limited by insufficient data on the distribution of pipeline crude, emissions effects on acid rain formation, and the limitations of the deposition models available to predict impacts with reasonable certainty. Data describing acid rain impacts in Texas were provided by the TACB from direct measurements and effects research. The TACB is not aware of any documented evidence which show precipitation samples taken in the Houston area with pHs in the "threes".

RESPONSE TO LETTER 56

56-123 The significance criteria are based on the accumulated professional judgement of land use and recreation planners as represented in numerous previous pipeline and industrial development impact analyses. We continually seek new information against which the criteria are tested and would welcome your input if you have documented evidence that the thresholds employed in the Draft SEIS are too low or too high.

56-124 The criterion of 25 percent permanent demand on other infrastructure was developed based on capacity levels of public facilities and services. Generally, governmental public services maintain a level of operation higher than the existing demand. This level provides for population growth and smooth financial capital expansion transitions. The 25 percent threshold is a level over and above what a government service would typically be able to provide for; financial difficulties, diminished quality of services, and limited capacity could be experienced at this threshold level.

56-125 The boring of roads and railroad grades is done by drilling a straight horizontal hole from one side of a grade to the other. Directional drilling of a stream requires drilling a curved hole from high bank to high bank. A computerized directional drilling head is used to direct the path of the drill. If rock or boulders are encountered, the directional bore hole may require abandonment. The procedure requires knowledge of a number of geotechnical variables for successful execution and is relatively expensive for large diameter holes. Please see response to Comment 56-108 for a discussion of sedimentation impacts.

Common construction methods minimize road damage. Mitigation Measure T-1 in Appendix A provides for road repair. The BLM Authorized Officer will regulate improper parking.

56-126 Please refer to the response to Comment 56-71.

56-127 The significance criteria were applied to all areas along the proposed and alternative route alignments, including low noise areas.

56-128 To state that noise "begins to have physical impacts on humans" at the 70 dB level is an oversimplification of a very complex and as yet unresolved issue. In fact, "it has been postulated that the (deleterious physical) responses to meaningless noise up to sound pressure levels of 95 dB may be regarded as harmless on limited repetition..." (Harris 1979). OSHA regulations permit exposure in the workplace of levels up to 90 dB (A-weighted) for an 8-hour day. Sound pressure levels of 90 dB are more than 100 times greater than sound pressure levels of 70 dB. We don't mean to suggest any specific comparability between OSHA workplace standards and community noise impacts from construction, but the literature indicates reasonable precautions, as noted in Section 4.7.15 on page 4-194 of the Draft SEIS, are sufficient to protect the community from short-term construction noise levels of 70 dBA. Regarding mitigation for the two residences, please refer to Mitigation Measure N-1 in Appendix A.

56-129 AAPL, during the ROW acquisition process, will negotiate with the landowners to minimize damage to existing operations, such as mining or oil and gas development. If damage is inevitable, AAPL will be required, as part of the ROW acquisition, to mitigate for those damages. If potential reserve loss is large, the cost of the ROW acquisition would be greater than that which preempted this use. Normally the pipeline would be realigned in these situations. Generally, the pipeline ROW would attempt to parallel roads and other features that are not to be developed in the future extraction process.

Your comment regarding rerouting around known mineral and energy resources has been noted.

56-130 The assumption used in making a conclusion of no significant impact is that the concentrations of a fuel spill would be low. Mitigation Measure AB-1 in Appendix A would limit the volume of fuel allowed and area of refueling relative to the stream.

56-131 Mitigation for the loss of 120 acres of riparian vegetation is discussed in Mitigation Measure TB-1 in Appendix A. Oak-mesquite-juniper and post oak communities were not included in the significance criteria, and construction impacts to these areas would not be considered significant.

56-132 Please refer to the response to Comment 56-6.

56-133 Please refer to the response to Comment 56-6.

56-134 Please refer to the response to Comment 56-128.

56-135 Please refer to Mitigation Measure SS-2 in Appendix A.

56-136 Your comment regarding mitigation of sensitive plant species is noted. Please refer to the response to Comment 56-55. The Tobusch fishhook cactus and Texas snowbell surveys have been completed. These species do not occur within the 100-foot ROW.

Regarding the Attwater's greater prairie chicken, please refer to the response to Comment 56-6 and Mitigation Measure TB-10 in Appendix A.

56-137 Recreational impacts due to an oil spill are difficult to quantify for several reasons: 1) the variations of oil spill scenarios are infinite (e.g., location, size, containment, dispersion, cleanup); 2) recreation areas within the study area have varying levels of use, and 3) revenue generated by tourism and recreational activities has not been estimated for most areas. The economic impact on Aquarena Springs can be approximated at over $20 million dollars, due to extensive research by Mr. J. Lloyd Moore on tourist-related revenue generation in San Marcos. It has been stated that recreational impacts related to oil spills would be significant in many areas as shown in Table 2-12, page 2-44 of the Draft SEIS. No significant construction impacts were identified.

56-138 Please refer to the response to Comment 56-128.

56-139 Your comment regarding the No Project Alternative and the use of existing carriers is noted. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172. The 25-year old Rancho Pipeline is the newest of the existing pipelines. Most pipeline longevity is 40 years, based on equipment deterioration, corrosion, and other wear factors. Beyond this point, the pipelines decrease in economic viability because of the need for maintenance and repairs. Due to the oil volumes to be shipped and the age of these carriers, using existing common carriers could increase the safety risk to several times greater than that for the All American Pipeline, since 300,000 BPD would be distributed through a number of these carriers.

56-140 Based on the a throughput of 300,000 BPD during a 40-year project life, the number of tanker spills is estimated to be about 6 spills greater than 1,000 barrels. Tanker spills are larger in magnitude (average 19,000) than those from pipelines (average 3,400), and the resources at risk are much more vulnerable and more difficult to protect. Please refer to page 4-172 in Appendix A for tanker impacts. These routes would extend over 5,500 ocean miles and risk marine resources along the Pacific Coast and Gulf Coast of Mexico. These include important recreation resources, marine biota, and other valuable resources in both the U.S. and Mexico.

RESPONSE TO LETTER 56

Cumulative impacts were evaluated for projects such as Pactex, Stacy Reservoir and other pipelines. It was determined that the Pactex Pipeline impacts would not overlap with those of the All American Pipeline, since Pactex extends from California to Midland, Texas and the All American Pipeline is from McCamey to Webster, Texas. A minor conflict with construction workers could occur, but it is unlikely in the currently depressed pipeline construction market which could provide ample staff for both projects.

The AAPL ROW realignment was to reduce conflicts with the Stacy Dam and Reservoir; therefore, the new alignment was placed 30 miles downstream. The only potential cumulative impact between these two projects is the possible impacts on the Concho water snake. Constructional and operational impacts from the Stacy Dam and Reservoir are significant for the Concho water snake. A potential oil spill during operation from the All American Pipeline could have significant downstream impacts on the Concho water snake, and combined with the Stacy Dam and Reservoir, extenuate the loss of the Concho water snake population. Mitigation Measure TB-9 is aimed at reducing these potential impacts. See Modifications and Corrections section for page 4-174.

56-141 The BLM will provide an Authorized Officer for enforcement of identified mitigation measures and stipulations. Please refer to the response to Comment 6-15.

56-142 Please refer to response to Comment 56-19.

56-143 Please refer to Table 4-9 in the Draft SEIS. The estimated spill at Mile Post 350 is a terrestrial spill. This location was chosen because of the long block valve spacing and the upstream elevation profile of the pipeline route.

Terrestrial spills are discussed on page 4-50 of the Draft SEIS. All rivers with significant impacts are addressed by the various disciplines. Table 4-62 represents those streams recommended for remote-control block valves.

56-144 Your comment concerning Mitigation Measure GW-4 is noted. The assertion is not that it is acceptable to pollute groundwater. The likelihood of contamination is low, if it does occur, mitigation is necessary. Please review Mitigation Measures GW-1, GW-2, GW-3, and GW-4 in Appendix A.

56-145 AAPL, as part of their agreement with the Edwards Underground Water District, agreed to provide sealant over the Edwards Aquifer recharge zone. Page 2-39 in the Modification and Corrections section describes the materials and methods. The goal of the procedure is to direct leaking oil to the surface and away from solution channels, fractures, and fissures. The effectiveness of this technique near the Caverns of Sonora is questionable. Most leaks follow the path of least resistance and flow to the surface or down a trench. Larger leaks and ruptures would overflow the trench and potentially flow into channels, fractures, and fissures adjacent to the trench. In solution limestone, it is possible for the rock to further dissolve or shift causing new solution channels during the project life. The whole trench could be sealed, however, this would cause the trench to become a confined channel that would fill with water in storm events and possibly wash the pipe out on downhill sections. Surface drainage patterns would also be changed. Finally, because the pressure within the pipe is high, most leaks and ruptures have the capability of puncturing the seal and rendering it ineffective. For these reasons, sealant is not recommended in the mitigation measures for the Caverns of Sonora.

The measure to construct using rock trenchers rather than blasting at the Caverns of Sonora has been retained in Mitigation Measure G-3 and is based on all segments of the proposed pipeline within a 2-mile distance from the caverns.

56-146 By referencing "water bodies," Mitigation Measure AB-1 is intended to be used for perennial and intermittent streams and reservoirs.

56-147 TB-5 will be modified; the Oil Spill Contingency Plan includes storage of booms in trailers within the affected region. TB-11 will be finalized upon completion of field surveys. Black-capped vireo surveys were conducted during the nesting season in June 1987, by a TNHP species expert and an ERT senior wildlife biologist. TB-12 now includes relocation of the alignment and transplanting, if appropriate. Please see TB-1 for mitigation of riparian areas.

56-148 As discussed in the response to Comment 56-9, the proposed project is not expected to have significant O_3 impacts as a result of increased oil storage and transfer or refining due to strict emission controls which are imposed by the TACB on industry in an effort to reduce total emissions which affect O_3 formation.

56-149 Please refer to Mitigation Measure T-1 in Appendix A for potential impacts to existing roads.

56-150 Visual effects at other river crossings would not qualify as significant. Consequently, mitigation measures would not be required.

56-151 Please refer to the response to Comment 56-128. Landscape planting is generally considered to be an inefficient method of attenuating noise because of the extremely large areas and amount of plant materials required and the time required for plantings to mature and become even marginally effective.

56-152 As discussed in Mitigation Measure S-1 in Appendix A, restoration of disturbed areas may include reseeding with native plant species, where applicable. Please refer to the response to Comment 56-22 for a discussion of bundling cut vegetation for wildlife habitat enhancement.

56-153 Mitigation Measure TB-1 in Appendix A discusses mitigation of riparian impacts. Efforts to minimize ROW width and reseed and replant disturbed areas with selected adapted species, combined with enhancement or replacement of riparian habitat, would result in no significant impact to riparian areas.

56-154 Your comment concerning liability and restoration of recreation resources is noted. Please see response to Comment 18-2 and Mitigation Measure S-1 in Appendix A.

56-155 Your comment concerning this issue is noted. Please refer to responses to Comments 56-10, 56-72, 56-127, 56-128, 56-134, 56-138, and 56-151. Potential impacts of the No Project Alternative are discussed in the Modifications and Corrections section for page 4-172.

56-156 The overall effect of the proposed project on air quality is described in the Draft SEIS and response to comments. Irretrievable and irreversible impacts to air resources are not expected as a result of the project. Direct and indirect air quality impacts from the project are not of sufficient magnitude to have a permanent impact on the air resources of Texas. Impacts to noise and visual resources are discussed in the responses to individual comments.

56-157 The external corrosion correction factor is based on best engineering judgement.

RESPONSE TO LETTER 56

56-158 The initial Oil Spill Contingency Plan will be prepared six months prior to operation. It will be updated annually, following approval. The primary reviewers will include the BLM, DOT, and TWC. No formal review process exists for public input; however, the public may send recommendations to the reviewing agencies.

56-159 Your comment regarding this issue is noted.

56-160 The term satisfactory is appropriate. The on-scene coordinator makes the determination relative to methods and to the satisfactory completion of cleanup. Satisfactory means are not determined by the offending party.

56-161 The on-scene coordinator will recommend the proper reclamation and revegetation processes necessary to restore the land to its original land use. This may include land farming, plowing, aerating, and fertilizing of the soil. The coordinator may consider one of the recent biological innoculations such as microorganisms to assist in the cleanup.

56-162 The on-scene coordinator determines the success or failure of restoration efforts.

56-163 The locations for equipment will be determined in the final Oil Spill Contingency Plan. Please refer to response to Comment 18-6.

56-164 Your comment regarding health effects of trace constituents of crude is noted. Please refer to Appendix A of the Final SEIS in Modifications and Corrections Section 3.3.

56-165 Please refer to the responses to Comments 52-4 and 52-9.

56-166 Please refer to the responses to Comments 56-39 and 56-110 regarding cave invertebrates.

56-167 The comments regarding juvenile Atlantic Ridley occurrence are accurate as stated and were based on current data and contacts with species experts. Data do not indicate that bay's may be utilized to a greater extent by the Ridley than open ocean. Also, please refer to the response to Comment 56-58.

56-168 Regarding the loss of golden-cheeked warbler habitat, this type is fairly common along the proposed pipeline routes and in the region. This acreage includes all ash-juniper habitat and does not delineate quality nesting habitat where the bird actually occurs, which would probably be considerably less than the acreages give in Table E2-5. The habitat loss is not large enough to affect a significant portion of the population, although individual birds may be affected. Nests may be destroyed if construction occurs in the nesting season. This species is classified as a Federal Candidate-Category 2 species, and a state threatened species. No mitigation for loss of habitat has been recommended; however, habitat loss would be evaluated, if deemed necessary, by USFWS or TPWD under Mitigation Measure TB-12.

56-169 Please refer to the response to Comment 18-3.

56-170 Your comment regarding secondary standards is noted; please refer to the response to Comment 56-117.

56-171 Please refer to the response to Comment 56-9.

LETTER 56

RESPONSE TO LETTER 56

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56-169 Please refer to the response to Comment 18-3.

56-170 Your comment regarding secondary standards is noted; please refer to the response to Comment 56-117.

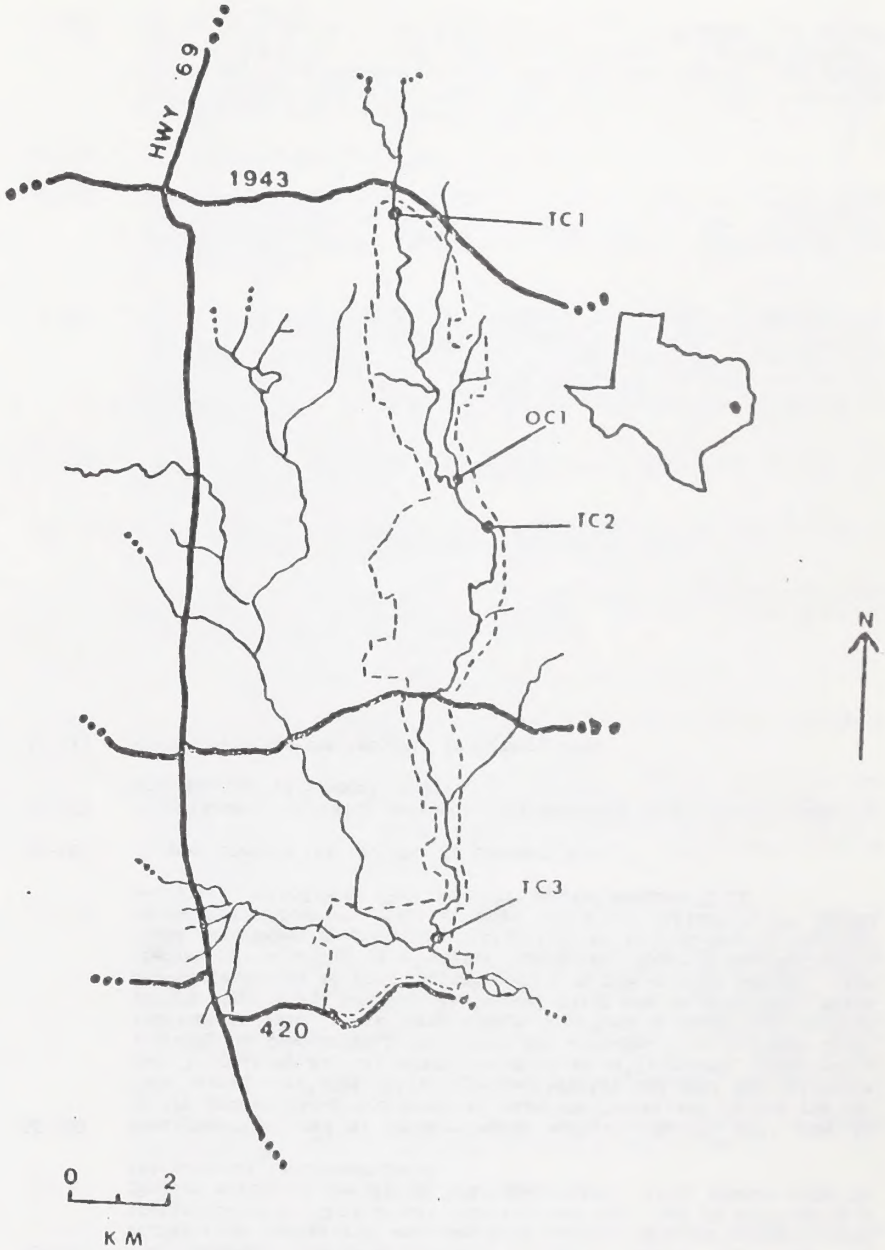
56-171 Please refer to the response to Comment 56-9.

Harrel, Richard C. 1984. Effects of a crude oil spill on water quantity and macrobenthos of a southeast Texas stream. Hydrobiology. 124:223-228.

Abstract

On December 6, 1981 an oil spill of 160 barrels (25,440 liters) occurred in a small southeast Texas stream.

Water quality changes, other than the presence of oil, were not evident until six months later when water temperature increased and stream flow ceased. This resulted in decreased dissolved oxygen and increased carbon dioxide concentrations. Responses of the benthic macroinvertebrate community included an increase in density of oligochaetes, decrease in numbers and taxa of chironomids, with eventual complete elimination, and low community diversity (d). Decrease in oil concentration resulted in reversal of these responses. No clean water taxa were collected and complete recovery had not occurred 26 months after the spill when the study was terminated.



Location of Turkey Creek (TC) and Oil Creek (OC) Sampling Stations. Dash Line is Turkey Creek Unit Boundary.

LETTER 56 (CONTINUED)

Table 1. Physicochemical Conditions in Turkey Creek and Oil Creek.

STREAM AND DATE	TEMP C	O_2 mg l^{-1}	O_2 % sat	CO_2 mg l^{-1}	AIK mg l^{-1}	pH	S Cond. µS cm^{-1}
Turkey Creek 1979-1980	9-28.5	6.9-11.2	83-103	2-9.5	9-29	5.2-6.5	41-63
Oil Creek							
Dec. 10, 1981	13	8.2	80	7.5	13	6.3	69
Dec. 21, 1981	14	7.8	78	14.5	4	5.8	83
Apr. 3, 1982	19	6.4	81	26.5	4	4.5	82
June 3, 1982	24	0.3	3.6	57.5	5	4.7	155
Nov. 13, 1982	9	2.7	2.4	29.5	17	5.8	68
Apr. 23, 1983	17	6.2	66	18.5	4	4.7	75
Feb. 4, 1984	9	7.6	68	15.1	3	5.3	40

Table 2. Community Structure of Benthic Macroinvertebrates in Turkey Creek and Oil Creek

STREAM AND DATE	DENSITY NO m^{-2}	NO TAXA	% Tubificidae (% *Limnodrilus*)	% Chironomidae	Diversity $\bar{d}$
Turkey Creek 1979-1980	588-3716	11-44	54-57 (34-51)	12-29*	2.65-3.54*
Oil Creek					
Dec. 21, 1981	1162	13	71 (51)	16	2.69
Apr. 3, 1982	2958	14	81 (75)	4	1.51
June 3, 1982	5188	13	94 (67)	1	1.25
Nov. 13, 1982	8427	4	99 (97)	0	0.17
Apr. 23, 1983	8481	13	93 (88)	1	0.83
Feb. 4, 1984	3046	16	43 (40)	32	2.41

* Chironomidae represented only 1% of the individuals and $\bar{d}$ was 1.84 during April, 1980 at Station TC 1 during extreme flooding and difficulty in sampling.

Longest U.S. oil pipeline short of customers

Kern Post 3-8-89 6E

Value questioned because of collapse in prices, limited offshore production

By RICH CARTIERE
Associated Press

BAKERSFIELD, Calif. — The nation's longest oil pipeline soon will be ready for business, but producers of California's cheap, heavy crude haven't yet signed up to use it.

The $1.2 billion pipeline was built across the Southwest on the premise that an anticipated glut of West Coast heavy crude would be able to compete in East Coast and Midwest markets.

But an expansion of offshore production has been delayed by environmental controversy, and inland producers are wary because of the collapse of oil prices.

"We went from being the pipeline that couldn't make it in time, to the one that made it too early," said Louis J. Resweber, spokesman for Celeron Oil Co., the nation's third largest independent oil company in terms of reserves, with 153 million barrels.

Its 1,225-mile underground All American Pipeline stretches from the Pacific Coast near Santa Barbara to McCamey where it connects with other pipelines, allowing oil to move on to Gulf Coast refineries.

The All American Pipeline is twice the length of the Trans-Alaskan Pipeline. It has a capacity to carry 300,000 barrels a day and is the first oil pipeline from the Pacific Coast to the Gulf Coast.

"This is something people have dreamed about for a century," said Steve Berg-Hansen, an oil industry expert formerly with the California Independent Producers Association.

Berg-Hansen thinks the pipeline will open competition between California petroleum and imported heavy crude from Mexico and Veneziela. It also could compete to a lesser extent with West Texas oil, he says.

But many producers are cautious when discussing the line's value.

They are concerned because of the continuing worldwide oil slump, an unresolved per-barrel shipping tariff, questions about timely delivery and several years' delay in a major expansion of production off California's coast as a result of environmental controversy.

Celeron has been a subsidiary of Goodyear Tire and Rubber Co. since 1983, but Goodyear has been seeking a buyer for the energy operation so it can concentrate on the tire business. The decision was part of a restructuring plan undertaken by Goodyear to fend off a takeover attempt by Sir James Goldsmith, an Anglo-French financier who held 11.5 percent of Goodyear's common stock.

Celeron officials said they intentionally did not seek advance commitments for use of the pipeline, which is contrary to standard industry practice.

"It's just the strangest way I've ever seen to build a pipeline," said Robert Walsh of Chevron USA, adding that his company has no plans to use the pipeline because it does not expect to have a surplus of heavy crude.

"They've taken on a major risk and with the scheme of things in the depressed world oil market, it's hard to figure out where they're going to get their first oil other than from themselves," Walsh added.

California's heavy crude generally sells for $3 to $5 a barrel less than lighter West Texas Intermediate, the U.S. benchmark that currently is selling for $16 to $17. The heavier the crude, the more it must be used for heating and fuel oil and other less profitable petroleum-based products.

Robert Mercer, Goodyear's chief executive, told reporters last year the pipeline needed to carry only 100,000 barrels a day to break even, as long as prices are $15 a barrel or more.

The pipeline was conceived when U.S. oil prices averaged $22.

Using its own oil, Celeron will start filling its pipeline in April. It will be ready to accept shipments from others by summer.

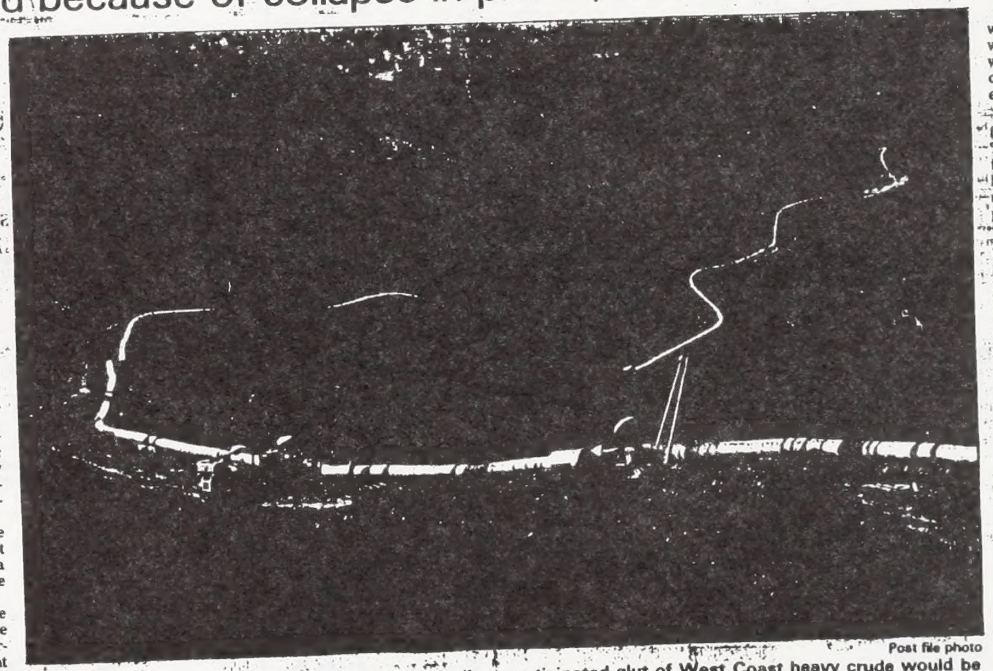
Those first shipments were originally expected from new offshore platforms planned near Santa Barbara. But most of those have been delayed.

Celeron instead is building a feeder-pipe to its 100 million-barrel South Belridge field in Kern County, which it bought from Chevron 17 months ago for $400 million.

Celeron has drilled 399 wells in 13 states the past two years, quadrupling its reserves.

Industry analysts believe Celeron will ask the Federal Energy Regulatory Commission for permission to charge about $3.50 a barrel to carry oil for other companies. That still is expected to keep it cheaper than many other sources, and Celeron has promised a tariff at least $1 a barrel below tanker costs.

"With concerns over timely shipments and costs, everybody's tried to leave the options open to a delivery system that may not work," said Bill Northrop, executive vice president of the 100-member Independent Oil Producers Agency. Tankers can ship for $4 a barrel or less, he said.



Post file photo

The $1.2 billion All American underground pipeline was built across the Southwest on the premise that an anticipated glut of West Coast heavy crude would be able to compete in East Coast and Midwest markets.

No recovery in oil drilling for California

LOS ANGELES (Reuter) — Drilling for oil in California should continue at last year's sharply reduced levels despite recent oil price gains, analysts said, because much of the oil in California fields is thick, heavy and expensive to extract.

Industry analysts said oil prices would have to increase to near 1985 levels — above $25 a barrel — before any significant recovery is seen in drilling.

"Companies will probably only drill their best prospects," said John Curti, an analyst with Birr, Wilson Securities Inc.

Additionally, few new wells are being drilled.

Only 33 rigs, about a fourth of the number available, were drilling for oil in California fields last week, compared with about 70 last year, said Bill Bolster of Munger Oil Information Services.

"It's in the dregs right now," he said of the state's drilling activity.

While an OPEC agreement to curb oil production boosted prices early this year, they have been below the $18 average target price on speculation that oil-producers might be exceeding their quotas.

Prices for California's marker grade, Line 63 blend, have slumped about 20 percent in the last month to $14 a barrel from a high of about $17.

Current prices are not high enough to justify increased drilling, said Ed Malmgreen of the California Independent Producers Association.

More than half of California's oil comes from stripper wells, which produce less than 10 barrels a day, and it costs between $18 per barrel and $25 to extract that oil. "It's not unusual for a stripper well to cost $18," Malmgreen said.

Many stripper wells along the Southern California coast produce eight times as much water as crude oil. Inland wells frequently require the use of steam injection to spur extraction of the thick, heavy oil, he said.

The lack of current exploratory drilling clouds the outlook for future production in the state, analysts said.

In the heart of California's oil patch, Kern County, which produces about two-thirds of the state's oil, exploratory drilling has slowed to a crawl.

Only 55 exploratory wells were drilled in Kern County last year, compared with 137 in 1985, according to David Mitchell of the state energy commission. So far this year, only five exploratory wells have been drilled.

LETTER 57

RECEIVED
BUREAU OF LAND MANAGEMENT
1987 MAR 25 PM 12:10
RIVERSIDE DISTRICT

March 20, 1987

Bureau of Land Management
1695 Spruce Street
Riverside, California 92509

I noted comments by Albert Blaha published in the Houston Chronicle on March 16, 1987, and wish to refute them as a private citizen.

I have had almost 20 years experience with the crude oil pipeline business and during that period have worked as everything from a leak-repairing, ditch-digging laborer to a major pipeline project coordinator. In addition to my professional qualifications as a pipeliner, I am an avid outdoorsman and have covered the walls of my office with pictures and trophies from fishing tournaments.

57-1 Without exception, the best fishing I've ever found on the Texas Gulf Coast is around oil and gas production platforms in the Gulf of Mexico served by numerous oil and gas pipelines that provide safe, environmentally acceptable transportation for production from said structures.

57-2 After much study and experience, I have concluded nothing the oil industry and its subculture of pipeliners can do, or have ever done, compares with the devastating destructive forces of nature itself. For example, compare all the pipeline rights-of-way you have ever seen to the devastation of Mount St. Helens; or the fish kills of last summer that resulted from the Red Tide in the Gulf of Mexico to the worst pipeline leak-related fish kill ever. The more such comparisons you make, the more you too will be convinced that Albert Blaha has not based his comments on facts.

57-3 As you are aware, the oil and gas industry has expended tremendous capital, physical and human resources to maintain the integrity of our environment. As a result, a wealth of knowledge and technical expertise exists today that can mitigate every phase of pipeline impacts on farmland and wildlife resources alike. Could it be that Albert Blaha made irresponsible comments to the press for personal gain?

Pipelines have been operating across Texas for most of this century doing their job in such peaceful, safe, and environmentally acceptable ways that the public is hardly aware

RESPONSE TO LETTER 57

57-1 Your comment regarding productivity of oil structures on fisheries in the Gulf of Mexico is noted.

57-2 Your comment regarding the destructive forces of nature are noted.

57-3 Your comment regarding mitigation effectiveness is noted.

Please refer to the Modifications and Corrections section for pages 4-4 and 4-20 which discusses the issue of mitigation measures more fully.

LETTER 57

57-4 of their presence. When Albert Blaha made his comments to the press, he probably didn't realize that there are about 49,400 miles of crude oil pipelines and 25,200 miles of products pipelines operating in Texas now. He also failed to mention that inspite of all the miles of pipelines Texas enjoys a very strong agricultural economy segment as well as thriving commercial and sport fishing industries. The existence of pipelines in Texas is essential in transporting crude oil to Texas refineries where it is made into fuel that is then distributed (by other pipelines) to the farmers of the United States making them some of the most productive farmers on earth.

57-5 Let me take this opportunity to congratulate the Bureau of Land Management for the fine job they have done on this much needed project and say as a private citizen I sincerely appreciate the leadership the Goodyear Company has demonstrated in making their large and daring investment in the pipeline that will enhance national security and provide jobs to many local citizens for far into the twenty-first century.

J. C. Towers
16314 Hickory Knoll
Houston, Texas 77059

JCT:jo

RESPONSE TO LETTER 57

57-4 Thank you for indicating the large number of miles of crude oil pipelines or product pipelines currently in Texas and their compatibility with current land uses.

57-5 Your comments regarding the demand for petroleum products at the Gulf Coast refineries, the need for national security, and the need for jobs in the Texas economy are noted.

LETTER 58

RECEIVED
BUREAU OF LAND MANAGEMENT
1987 MAR 25 PM 12: 19
DISTRICT

Buckholts Texas
March 23, 1987

Bureau of Land Management
1695 Spruce Street
Riverside Calif. 92507

Gentlemen:

The All American Pipeline Co. is proposing a northern route through Texas and through Milam County which will be going through property that I own. This line will cut a swath through the best land and,
58-1 furthermore endanger the only drinking water source on the farm, which is a well, not very deep. There also is a creek which would get contaminated
58-2 in case of a break which is very likely. That creek is a drinking source for many cattle. Also it will pass close to a cemetery. My grandparents grubbed this farming land from pasture and now the pipeline wants to come in and take it. We don't need it and we don't want it.

Yours truly
Mrs. Viola Dervik

RESPONSE TO LETTER 58

58-1 Your comment regarding your opposition to the selection of the Northern Alternative is noted; please review Mitigation Measure GW-3 in Appendix A regarding the potential effect of an oil spill on your well.

58-2 We understand your concern for the creek on your property but we are uncertain which creek you are referring to and at which location the creek is crossed. If an oil spill occurs on land near the creek, probably little or no oil would reach the creek as oil is viscous and flows at 3 to 9 feet per minute. Most creeks in Milam County are intermittent, and during most of the year a spill in the creek would affect a very limited area. Please refer to the Oil Spill Contingency Plan in Appendix B of the Draft SEIS and Modifications and Corrections for page B-53 for site-specific spill plans for details of an oil spill cleanup.

LETTER 59

EDWARDS UNDERGROUND WATER DISTRICT

1615 North St. Mary's
P.O. Box 15830
San Antonio, Texas 78212
(512) 222-2204

5.2-1.7-3.2

March 23, 1987

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County Area Chairman
JACK R. OHLRICH
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HAYS COUNTY
FRANCES D. EMERY
County Area Chairman
S.R. GREGG
JERRI W. MARTIN

William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

This letter serves as comment on the adequacy of the Supplemental Draft Envionmental Impact Statement (SDEIS) on the All American Pipeline Company's proposal to extend a crude oil transmission line from McCamey to the Texas Gulf Coast.

In general the SDEIS adequately addresses the issues. However, there is at least one issue that I raised at the scoping meeting in San Antonio that has not been given sufficient attention. At the scoping meeting it was recommended that more detail be provided concerning the actual need to construct a new pipeline from West Texas to any point east or southeast given the number and carrying capacity of the existing network.

59-1 Section 1.5 Purpose of and need for the Project does not address the issue of need for the project from West Texas to points east, it only speaks to the need, as stated by the applicant, for a project from California to the eastern United States. No actual need is established to extend this pipeline from west Texas to any other point in Texas. As I understand one of the purposes of the EIS process, sufficient information should be available to compare/balance the need for action with the environmental consequences/risks.

The SEIS appropriately recognizes that while the risk of ground water quality contamination to the Edwards Aquifer from the proposed route is small, the absolute removal of the risk is an improvement. In any pipeline route major efforts should be made to minimize the risk to water resources. It is recommended that most of the mitigation and risk management techniques described for the pipeline proposed route should apply to any portion of any route.

Thank you for this opportunity to comment.

Sincerely,

Thomas P. Fox

Thomas P. Fox
General Manager

TPF/gg

"Conserve water - protect the Edwards Aquifer"

RESPONSE TO LETTER 59

59-1 Your comment regarding the purpose and need of the project is noted. Please refer to the response to Comment 56-1.

LETTER 60

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO
THE COMMONS, BUILDING C, SUITE 310
4171 NORTH MESA
EL PASO, TEXAS 79902

OFFICE OF THE COMMISSIONER
UNITED STATES SECTION

MAR 2 3 1987

Mr. William Haigh
Federal Project Manager
U.S. Bureau of Land Management
1695 Spruce Street
Riverside, CA 82507

Dear Mr. Haigh:

We appreciate the opportunity to review and comment on your "Draft Supplemental Environmental Impact Statement for the Proposed All American Pipeline Project, January 1987.

Three pipeline routes are proposed across Texas from McCamey to Webster and Texas City. Of the three proposed routes, the U.S. Section favors the Northern Alternative which is also identified as the Bureau of Land Management's Preferred Alternative. The potential for an international impact (oil spill in rivers reaching international Amistad Reservoir) is much less than should the Proposed Alternative and Southern Alternative be selected. 60-1

Thank you again for the opportunity to comment.

Sincerely,

George R. Baumli

George R. Baumli
Principal Engineer
Planning & Treaty Operations

RESPONSE TO LETTER 60

60-1 Your comment regarding support of the Northern Alternative for the All American Pipeline is noted.

LETTER 61

March 18, 1987
1701 Calhoto Rd.
Kerrville, Texas

RECEIVED
BUREAU OF LAND MANAGEMENT
1987 MAR 26 PM 12:02
RIVERSIDE DISTRICT
RIVERSIDE, CA.

Mr. William Haight
U.S. Bureau of Land Management
1695 Spruce St.
Riverside, Ca. 92507

Dear Mr. Haight;

I attended the Austin and Fredericksburg meetings of the hearings on the proposed route of the "All-American" pipline. I spoke at the Fredericksburg hearing and in writing, again wish to go on record as to being opposed to its crossing Texas period, but feel that the southern route would be even less damaging than the central or northern possibilities.

61-1

I took some pictures of All-American ROW damages in Crockett county and of an area damaged by another company pipe line rupture and explosion recently. I gave them to Elgin Pope and he turned them in with this letter.

We must protect our water and enviorment because it is all dwindling so fast and it won't be too long before water will be more valuable than all the oil going thru all the pipe lines.

RESPONSE TO LETTER 61

61-1 Your comment regarding opposition to all routes for the All American Pipeline across Texas is noted. Your opinion that the Southern Alternative would be the least damaging of the three routes analyzed in the Draft SEIS is also noted.

LETTER 61

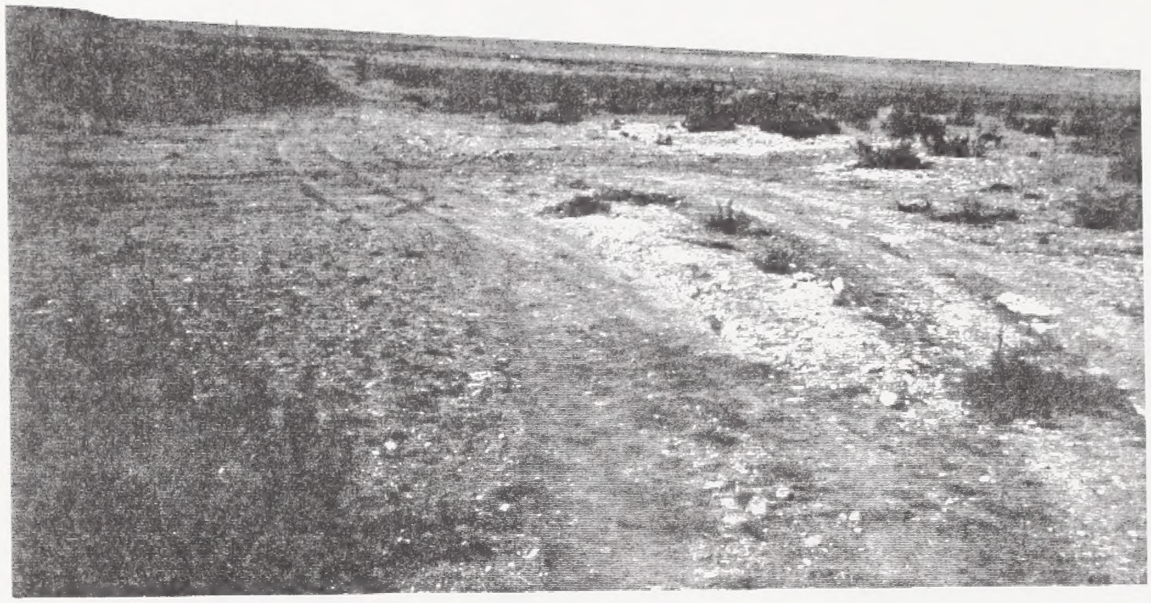
On behalf of all of my friends, relatives, and neighbors, I respectfully request the BLM do all it can to help insure the future of our land and life for our heirs.

Thank you.

Sincerely,

Hazelle Calcote
Kern County Supervisor

RESPONSE TO LETTER 61



#2

another shot of Crockett Co. Pipe Line rupture. See #1 note devilization of soil covering about 5 acres

Hazelle Calcote

LETTER 62

RECEIVED
BUREAU OF
1987 MAR 27 PM 12:20
DISTRICT

March 22, 1987

Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

I am a Texas resident with interest in property located in Kimble and Kerr Counties. I would like to quickly comment on the adequacy of the Draft Supplemental Environmental Impact Statement, regarding All American's Pipeline through Texas.

This document is clearly slanted toward the Pipeline's favor, with many contradictions and incorrect statements.

For example:

62-1 1. Section 2, page 12. "Pipeline manufacture and quality control", is contradictory to testimony I've heard.

62-2 2. Section 2, page 20. "...Minium charges...shock effects would not propagate any further than the immediate ROW." This is impossible to do as the rock formations are much more extensive than the immediate ROW.

62-3 3. Section 3, page 30. "Karstic Terrain" This section is contradictory.

62-4 4. Section 3, page 84. "Hill Country" Incorrect. The Hill Country is much larger than Kimble, Gillespie, and Blanco Counties.

62-5 5. Section 3, page 84. "Caverns of Sonora" Particularly at risk due to the close proximity, "within one mile of the Proposed Route".

62-6 6. Section 4. "Because the final engineering design is not complete...", this entire section is hypothetical and useless.

62-7 7. Section 4, page 16. "plausible, yet conservative assumptions on the spill characteristics", are fraudlent.

All of these topics and others I've not mentioned, add greatly to the volume, but are of dubious factuality. In my opinion, this study weighs a lot but actually carries very little weight in truth.

Sincerely,

Sally Frederick

Sally Frederick

RESPONSE TO LETTER 62

62-1 Please refer to page 2-12 of the Draft SEIS and Modifications and Corrections page 4-8 for a description of quality control of pipe manufacture.

62-2 The fact that formations extend beyond the pipeline ROW has no influence over the impact radius resulting from a given blast. For a blast design in a specific formation, the radius of propagation of "damaging" particle accelerations can be accurately determined. See Mitigation Measure G-5 in Appendix A of the Final SEIS.

62-3 Your comment concerning karstic terrain is noted, please refer to Comment 68-39.

62-4 Your comment concerning the "Hill Country" is noted and agreed with.

62-5 Your comment regarding potential risk to the Caverns of Sonora is noted; please refer to the response to Comment 56-47.

62-6 Please refer to Modifications and Corrections for page 4-2.

62-7 These data are the best available for making the spill volume calculations.

ENERGY ANALYSTS INCORPORATED
NEW ORLEANS OFFICE

LETTER 63

RESPONSE TO LETTER 63

March 10, 1987

Mr. William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

I have enclosed my comments regarding the Draft Supplemental Environmental Impact Statement (SEIS) for the proposed All American Pipeline Project.

Please note that my comments include several items that I presented for consideration at the scoping sessions that preceded the preparation of this SEIS. In my opinion, these items of concern have not been covered by the SEIS and, therefore, I do not consider this SEIS to be adequate consideration of safety issues.

Thank you for the opportunity to present these comments for your consideration.

Sincerely,

C. Dale Zinn
Vice President

pc

Enclosure

800 Commerce Road West
Suite 103
New Orleans, LA 70123
(504) 734-0944

LETTER 63

COMMENTS

for

PUBLIC HEARINGS ON DRAFT EIS

for

ALL AMERICAN PIPELINE PROJECT

63-1 **1.0 INTRODUCTION**

During the scoping sessions for this EIS, I presented several items of concern regarding the Draft EIS coverage of these items and some additional items in the Draft EIS that are not, in my opinion, properly covered and/or completely explained.

2.0 ITEMS OF CONCERN

The following items were presented by me for consideration by the EIS:

A. ACCIDENTAL RELEASES OF OIL FROM THE PIPELINE

63-2 1. Release scenarios should be identified.

It is my opinion that this area is inadequately treated in the EIS. Although a "worst case" release scenario is presented, enough detailed information is not given to evaluate the reasonableness of this scenario or its results. For example:

What release scenarios were considered before this scenario was selected as the "worst case"?

How were the amounts released calculated?

What size hole is assumed in the pipe?

Is this a full diameter rupture, and if no, why not?

63-3 2. Spill rates and amounts should be estimated. Source of data and/or engineering information should be clearly identified.

Again, the applicant does not present sufficient information to justify his estimates. For example, it appears that the pipeline will hold approximately 4615 bbls of oil per mile and the stretch of line from the

RESPONSE TO LETTER 63

63-1 The following responses address your specific concerns.

63-2 The pipeline rupture scenario described in Appendix C of the Draft SEIS was derived by assuming the simultaneous or near-simultaneous occurrence of several extremely rare events. This scenario is now the Onion Creek to Edwards Aquifer Oil Spill Scenario in Appendix B of the Final SEIS. It also includes rare events such as pipeline rupture at the point closest to Onion Creek, complete severance of the 30-inch line, and initiation of a rainstorm event that would cause 100 percent of rainfall and spilled crude which actually reached the creekbed of Onion Creek to penetrate the Edwards Aquifer shortly after the break. Spill volumes for this break were calculated following basic hydraulic equations as described in the Modifications and Corrections for page 4-20.

63-3 The procedures for the oil spill volume calculations at the Edwards Aquifer recharge zone are described in the Modifications and Corrections section for page 4-20. The primary reason that the spill volume estimate was smaller than you expected is that the calculations in the Draft SEIS accounted for the mitigation provided by remotely operated block valves which were included in AAPL's project design for that area.

LETTER 63

63-3 Cont. upstream block valve is about two miles, yet the applicants estimated release volume is 3230 bbls.

How was this result estimated and how realistic is this result?

63-4 3. Consequences of these spills should be specified.

Consequences of the so-called "worst case" spill are presented in very general terms in Appendix C of the EIS; however, there are no estimates of potential impacts in terms of:

How many people could be affected by water contamination and for how long?

Are estimates of this type not possible?

This "state of the art" for making consequence estimates for crude oil spills on land and in water supplies should be discussed and the estimated consequences for spills from the proposed AAP Project should be justified.

63-5 4. Spill probabilities should be estimated. Source of data used should be clearly identified.

Spill probability estimates for the pipeline are made using spill information and correction factors developed in a Petroleum Pipeline Leak Detection Study performed by Mastandrea. The general methods used in this approach are basically sound; however, there are some specific points in terms of selection of reference points, and correction factors that should be questioned. For example:

Why is the selection of the reference pipeline as a 25 year old, 10 inch diameter pipeline a reasonable selection? The characteristics assigned to this pipeline from which correction factors are to be applied to average pipeline failure data should be justified.

Further, Mastandrea developed a spill rate or volume correction factor related to pipeline diameter. This correction factor was based upon spill statistics from pipeline releases and results in correction factors that are less than the square of the ratio of the diameters of the pipelines. This factor appears to considerably understate the amounts released from full diameter ruptures.

63-6 In the Draft EIS, there are several spill volume and frequency correction factors that have been stated as assumptions without reasonable justification, i.e.,

RESPONSE TO LETTER 63

63-4 Your comment regarding estimated potential impacts of aquifer pollution is noted. Discussions with EPA Emergency Response Branches from Regions 2, 6, 8, and 9 have indicated that these experts have had little experience with aquifer contamination from crude oil spills. However, based on that limited experience, crude oil spills would be more likely to affect individual wells rather than entire aquifers. The length of time it would take for wells to recover would be conjecture at this time. Please refer to revised Mitigation Measures GW-1 and GW-3 in Appendix A.

63-5 The characteristics of the reference pipeline cited in the Draft SEIS were taken from the Mastandrea study and were not independently derived by the preparers of the Draft SEIS. The comment that the diameter correction factor should be proportional to the cross-sectional area of the pipe applies only to full-diameter ruptures, which historically account for very few pipeline failures. The correction factors referenced in this comment were also taken from the Mastandrea study and are based on observed statistical variations in average leak volumes versus pipeline diameter.

63-6 The specific spill correction factors cited by this comment were derived based on the best engineering judgement of the Draft SEIS preparers. It is admitted that these are best judgements only, and that no statistical data were used to make these estimates. The preparers are unaware of any statistical data on which to base these correction factors.

LETTER 63

63-6 Cont.

a. Page A-7--leak detection mathematical modeling volume correction factor assumed to be 20%.

b. Page A-3--minimizing water and hydrogen sulfide content of crude assumed to be 20%.

c. Page A-4--increased pipe thickness, more pipe markers, and deeper burial assumed to reduce risk by 80%.

d. Page A-4--extra cathodic protection testing reduces external corrosion risk an assumed 33%.

e. Page A-4--extra pipe thickness reduces internal corrosion proportionally to the square of the thickness increase.

The use of a large number of correction factors, many of which appear to be arbitrarily determined, does not indicate that the spill probabilities were conservatively estimated, and thus raises questions about their validity. How much error could there be in these estimates?

63-7

B. DOES THE ALL AMERICAN PIPELINE REPRESENT A HAZARD TO MEMBERS OF THE GENERAL PUBLIC?

Specifically, can fires or explosions result from this pipeline?

What is the predicted magnitude of these hazards?

No information is present in the Draft EIS regarding these questions.

63-8

C. HOW WILL RELEASES OF OIL FROM THE PIPELINE BE DETECTED?

What quantity of oil could be released from this pipeline?

63-9

Are small rate leaks potentially more of a problem in terms of the amount spilled and the effect or the aquifer than large rate leaks?

63-10

The spill detection system is described on Pages 4-5 through 4-7 with the design sensitivity given in Table 4-2. The significant question about this is how realistic are these parameters, i.e., can they actually be attained in an operating pipeline system? These values appear to be at least an order of magnitude better on the low rate end than those indicated by Mastandrea.

D. WHAT IS THE COMPOSITION OF THE CRUDE OILS THAT ARE TO BE CARRIED BY THE PIPELINE?

63-11

Is hydrogen sulfide present in any of these crude oils?

RESPONSE TO LETTER 63

63-7 Please refer to the Modifications and Corrections section for page 4-5 for this information. Also, please refer to Mitigation Measure SS-9 in Appendix A.

63-8 Figure 4-1, Table 4-8, and pages 4-37 through 4-39 of the Draft SEIS give spill volume estimates for several key impact receptors. Please refer to the response to Comment 63-2 for more details on the model used to make these estimates.

63-9 Please refer to the Modifications and Corrections section for page 4-6 for discussion of the issue of chronic low-volume pipeline leaks.

63-10 Revised data on the design sensitivity of the leak detection system have been included in the revised Table 4-2, see Modifications and Corrections section for page 4-7. Similar leak detection sensitivities are presently being achieved on most other modern crude oil pipelines. The proposed leak detection sensitivity exceeds that of many older pipelines.

63-11 Please refer to the Modifications and Corrections for page 4-4.

LETTER 63

63-11 Cont. Crude oil properties are given in Table A1-1 on Page A-2 of the EIS Appendices. Sulphur is listed as a component of these crudes. No discussion is given in the EIS about hydrogen sulfide, and why it is, or is not a hazard.

E. IS A FULL DIAMETER RUPTURE OF THIS PIPELINE POSSIBLE.

63-12 A full diameter rupture of a pipeline is about the worst failure that can occur.

What are the consequences of such a failure, and what is its probability of occurrence?

63-13 Has the project proponent conducted any pipe fracture studies to determine what pipe damage could be sustained before a complete rupture results?

63-14 Appendix C appears to address the rupture question; however, it is questionable if this discussion refers to a full diameter rupture, i.e., see Line 1 and Line 11 on Page C-7.

63-15 There is no information contained in the EIS describing pipe fracture studies conducted by the applicant or any prediction of the amount of pipe damage from outside forces, for example, before full pipe rupture occurs.

RESPONSE TO LETTER 63

63-12 The pipeline leak rates stated in the Draft SEIS are for all leaks greater than 50 bbl. It is not known quantitatively what percentage of these failures may be full rupture failures, but from the historical data, it can be inferred that such an occurrence has an extremely small probability.

63-13 AAPL conducted a number of inspections, refer to page 2-12 of the Draft SEIS and to the Modifications and Corrections section for page 4-8.

63-14 The spill volume used in the Edwards Aquifer recharge zone oil spill scenario was based on a full diameter rupture; please refer to Table 4-9 of the Draft SEIS. Also, the discrepancy on Page C-7 of the Draft SEIS has been corrected; please see the revised Appendix C Catastrophic Oil Spill Scenario in Appendix B of the Final SEIS.

63-15 Please refer to the response to Comment 63-13.

LETTER 64

CHARLES WOODRUFF, JR., CONSULTING GEOLOGIST
P.O. BOX 13252, CAPITOL STATION
AUSTIN, TEXAS 78711
23 March 1987

Mr. William Haigh, Federal Project Manager
U.S. Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

I am writing in response to the Draft Supplemental Environmental Impact Statement (DSEIS) for the proposed All American Pipeline Project. My comments are in two parts. The first addresses the issues that I raised during the scoping process. The second part is in response to the supposed "worst-case" spill scenario presented in the DSEIS; this second part largely reflects the comments that I made orally at the public hearing in Austin on the afternoon of 2 March 1987.

PART I--ISSUES IDENTIFIED DURING SCOPING PROCESS

During the scoping process I focused on the segments of the pipeline that cross the Edwards aquifers--both on the Edwards Plateau and within the Balcones Fault Zone. These areas are critical owing to the dependence of many thousands of people on the Edwards as their only water supply. I thus enumerated aspects of materials, landforms, and processes that should be assayed in a proper evaluation of environmental impacts on these aquifer systems.

64-1 I noted that the facets to be inventoried should be addressed at a scale commensurate with available data and with the importance of the feature in question to the process of recharge. The smaller of the suggested scales of view (for assaying the depth and configuration of the potentiometric surface, for example) is 1:62,500. I suggested that the larger scale for inventorying more detailed data should be 1:24,000 (for locating individual water wells, sinkholes, faults, and the like). The DSEIS, however, presents almost all data at a scale of 1:250,000--an order of magnitude smaller than that recommended. Despite the

64-2 danger to groundwater resources along the "preferred" route, there was no inventory of existing water wells, their depth, method of completion, use, water quality, or yield. Nor was

64-3 there an inventory of sinkholes, caves, faults, and the like. For example, figure 3-3 does not even recognize the Edwards outcrop in the fault zone between Kyle and Driftwood as being a karst terrain--all because of the semantics of state-wide environmental unit nomenclature as presented by Kier and others (1975). In fact, there are at least 18 sinkholes within a mile of the pipeline route between Driftwood and Kyle; some of these features now have (or once had) cavernous openings that offer direct, rapid recharge into the aquifer.

RESPONSE TO LETTER 64

64-1 Inventories were plotted on 1:24,000 scale maps. The SEIS used 1:250,000 scale because the information can be plotted in a useful manner at that scale while keeping the total number of maps in the SEIS to a reasonable number.

64-2 Your comment regarding well inventories is noted. Please refer to revised Mitigation Measure GW-1 in Appendix A of the Final SEIS.

64-3 Your comment regarding karstic terrain and localized karstic features is noted; please refer to the response to Comment 52-28. Also, please refer to Sections 2.2.2.11.3 (pages 2-27 through 2-30) and 4.2.2.3.3 (pages 4-31 through 4-33) in the Draft SEIS and to Mitigation Measure SS-7 in Appendix A of the Final SEIS.

LETTER 64

64-4 The DSEIS seems to be lulled into not regarding the caves and sinkholes and faults along this segment of the route because of the commonly cited statistic that 83 percent of all recharge into the Barton Springs segment of the Edwards aquifer occurs in the channels of major creeks. In fact, this is true only because the creek bottoms are where most water is concentrated most of the time. There are other areas amenable to recharge should fluids be placed there in any appreciable amount. The sinkholes and caves along the "preferred" pipeline route are excellent examples of "point loci of recharge" as defined by the City of Austin Office of Environmental Resources Management.

64-5 In brief, the DSEIS did not address the topics that I suggested during the scoping process for a correct (but still incomplete) assessment of potential impacts on the Edwards aquifers owing to the construction and operation of such a pipeline. Especially egregious is the disregard for the data readily available on wells, springs, sinkholes, caves, and faults along the proposed "preferred" route.

PART II--ANALYSIS OF "WORST-CASE" SPILL SCENARIO

64-6 Appendix C of the DSEIS contains a pipe-rupture/oil-spill scenario for the Balcones Fault Zone segment of the Edwards aquifer. This scenario is not a "worst case" situation for several reasons: 1) The volume of oil spilled is approximately half the historical average for spills from pipelines of 30-inch diameter (Rose, 1986). 2) In 1979, a smaller pipeline ruptured in Kimball County, Texas, and spilled approximately eight times the volume of oil presented in this scenario. 3) The volume spilled in this scenario is significantly less that the amount that could occur between block valves within the reach of the proposed spill. 4) All the spilled material is presumed to exit from the rupture by surface flow before entering the aquifer via (diluted) creek flow in Onion Creek.

Three alternate scenarios are presented here. One is a rupture under conditions similar to those described in Appendix C, with the difference being the location of the break; in my first scenario, the spill would occur upstream from (but close to) the recharge zone in the Onion Creek watershed. The second scenario would be a rupture of the pipe within the recharge zone owing to cavern collapse beneath the line. The third scenario would also be within the recharge zone, but would be a slow leak at a rate below that which would allow immediate detection.

Alternate Scenario 1--Contributing Zone, Onion Creek Watershed

64-7 The scenario presented in Appendix C would be partially valid for the contributing zone to the Edwards aquifer immediately upstream from the recharge zone in the Onion Creek watershed. The valid part of the scenario would be the discharge of oil at

RESPONSE TO LETTER 64

64-4 Your comment concerning contamination of the Edwards Aquifer recharge zone is discussed in Comment 1-1.

64-5 Please refer to the response to Comment 64-4.

64-6 The Onion Creek to Edwards Aquifer oil spill scenario has been revised; please refer to Appendix B of the Final SEIS.

64-7 Please refer to the response to Comment 64-6.

the ground surface and its flow into nearby water courses and ultimately into Onion Creek.

The invalid part of the scenario would be the volume of spilled material, since--in the area upstream from the recharge zone--the distance between block valves is more than 2 miles (approximately 12,500 ft according to map 2.2 in the DSEIS). The pipeline would contain approximately 0.9 barrels of oil per linear foot (a total of 11,250 barrels within the segment in question). This oil is transmitted at a rate of 12,500 barrels per hour (200 barrels per minute). Hence, even given the immediate response time and a shut down of the block valves within 4 minutes, there would be an initial spill of 833 barrels. The entire pipe segment could be evacuated in about one hour. And this total volume--more than 12,000 barrels, or 507,500 gallons of petroleum--would be on the ground when the clean-up crews began arriving on the scene in 2.5 hours.

Allowing for the much greater volume of spilled petroleum (3.7 times the amount allocated in the DSEIS scenario) and the consequent increased volume entering the aquifer, the scenario presented in Appendix C (response time, impacts of rainfall, rates of recharge, and the like) is far from a "worst-case" situation.

64-7 Cont.

The overall impacts on the aquifer could be much more severe; the entire recharge zone of the creek would be traversed by the oil/water mixture--a distance of more than 51,000 ft. Since the entire recharging reach of Onion Creek is crossed, the rate of recharge would be 120 cfs; the water composing this recharge could contain 50 mg/l of dissolved hydrocarbons with an additional fraction entrained on the water surface. Assuming a storm event of the same rainfall magnitude described in Appendix C--but localized within the tributary watershed, almost all of the 132 cfs runoff generated within the sub-basin would recharge the aquifer within the channel of Onion Creek. Much of the fraction not contributing to recharge would be accounted for in bank storage and in wetting the perimeter of the previously dry Onion Creek Channel.

The fraction recharged would include the material in solution, and most of the oil entrained with the water, although some of the oil would remain as coatings along the streambank and on vegetation. The total amount of petroleum thus recharged depends on the amount of oil entrained and dissolved by the flow of the tributary, which in turn is a function of the duration of the rainfall, the gradient of the stream, the amount of vegetation in the vicinity of the spill, and the like. At any rate, the amount of oil entering the aquifer would be considerably more than 77 barrels. This material, then, would form a plume of pollution that would begin to move down gradient. The plume would continue to be fed by the free oil suspended on top of the groundwater, so that water moving toward discharge points would be well above the

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64-7 Cont. taste/smell threshold cited in the DSEIS (a threshold that is probably too high, as will be documented later). Owing to this plume containing hundreds of barrels of oil, increased pollution would result in ruined groundwater supplies within most of the aquifer recharged by Onion Creek.

Scenario 2--Catastrophic Rupture, Edwards Recharge Zone

This scenario presupposes a rupture of the pipeline as a result of cavern-roof collapse beneath the line. Such a rupture could release all the oil from between block valves, and the collapse of the lined trench into a cavern would provide open megaporosity as large conduits for recharge of essentially all the petroleum between block valves in this area. An estimated down-gradient distance between block valves along this reach of the line is 12,000 ft; hence approximately 10,900 barrels of oil could be spilled. Again, depending on the size of rupture and the size of the cave, all this petroleum could empty into a cavernous opening within less than an hour.

In this way, more than 453,600 gallons of oil would drain into the vadose zone, with no surface discharge and perhaps even no indication of exactly where the break occurred. Because of the cavernous openings, there would be little or no mediation of water-quality impacts from adsorption and other surface effects. The cavern walls would, however, receive a continuous coating of petroleum, as would the surfaces of micropores within the vadose zone. These coated surfaces would then act as long-term sources for continued leaching by infiltrating vadose waters. The im-
64-8 mediate impact--a slug of oil emptied directely into the aqui-fer--would have devastating impacts.

Since this break would occur below ground with none of the petroleum discharged at the surface, immediate efforts at clean-ing up the spill would be prevented. By the time the collapsed line segment could be located and exhumed, a period of hours would likely have passed, and most of the oil in the line segment could have emptied into the cavity--this despite the monitoring of the pressure loss and the shut-down of the block valves within minutes of the break.

Given the size of caverns that occur in the Edwards recharge zone (Natural Bridge Caverns, Interspace Caverns, for example), essentially all of the spilled oil could be transmitted to the water table, from which point a plume of entrained hydrocarbons (both in solution and floating on the surface of the groundwater) would begin migrating down the pressure gradient to discharge points including domestic and municipal wells (the town of Buda, for example) and springs (Barton Springs, and perhaps San Marcos Springs--depending on the configuration of the potentiometric surface at the time of the break). The only means for mediating such pollution would be to drill a screen of wells to draw down the aquifer downgradient from the spill. Such an approach takes

RESPONSE TO LETTER 64

64-8 Your comment regarding an alternate catastrophic oil spill scenario is noted. We focused our analyses on reasonable oil spill impact analyses and summarized resources at risk along all alternatives, refer to Comment 52-2.

time; in the meantime the pollution front would probably find its way into wells or would move on toward other discharge points. Mediation efforts will perforce be only partially effective. Decades, perhaps centuries, will be required for the impacts of such a spill to be abated.

Despite the references in the body of the DSEIS that the flow of water in the aquifer "is dispersed," there are localized zones of cavernous porosity that will allow the rates of flow envisioned here. For example, Bills, 1957, documented an instance during the Great Drought of the 1950's, when Waco Springs (in Comal County) were totally dry. A localized thunderstorm occurred within the Dry Comal Creek watershed, 12 air-miles to the west of the springs. Local rainfall maxima were documented to be 5.2 inches, with 2.76 inches measured at the Smithson Valley gage. Runoff occurred into headwaters tributaries within the recharge zone; no surface discharge occurred downstream. In other words, all surface flow entered the porous bedrock. Within 24 hours, Waco Springs began discharging turbid, debris-laden water at a rate of 2 cubic ft per second (cfs). This discharge continued for about 2 days, and in this way, approximately 7.92 acre ft of water were transmitted from the recharge zone to the springs. This volume is approximately 2.5 million gallons. The presence of leaves and twigs in the discharged water suggests that the springflow was the same water recharged during the brief rainstorm and <u>not</u> water previously in storage forced out by a pressure-head increase.

64-8 Cont.

In brief, this water was transmitted across 12 straight-line miles at a minimum rate of 44 ft/minute--a rate comparable to that of overland flow. It is notable that the terrain in which this rapid recharge and transmission of groundwater occurred lies within the same environmental geologic unit--namely karstic lowland--as the proposed pipeline route along the Onion Creek/Blanco River divide between Kyle and Driftwood (Bureau of Economic Geology 1985). These map units were established on the basis of terrain features and their effects on groundwater hydrology.

At least 18 sinkholes are identified on the karst plain where the pipeline is proposed to cross the aquifer. Some are as close as a few hundred ft of the proposed route. Caves also have been identified in the area. In addition, the proposed pipeline route crosses 15 mapped faults. In short, this area has manifest fracture porosity. These fracture zones have been enlarged by solution, resulting in the sinkholes and caves in the area. These karst features can assimilate enormous volumes of fluids, should the fluids be made available. Porosity of this scale, offers underground pipe flow into the aquifer, and (unlike a sandstone aquifer) does <u>not</u> contain a network of tiny intergranular spaces.

Collapse of caves, and so-called "active sinkholes" are not common on the Edwards Limestone terrains, but such events have

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64-8 Cont. been documented (see, for example, Hunt, 1984, p. 803-810). Hence, solutional processes are ongoing, and the scenario presented here is not out of question.

Scenario 3--"Ghost Leak," Edwards Recharge Zone

The third scenario presupposes a leak that develops slowly over a period of years and is below the level of detection by the computerized flow-sensors. Such a leak might be as large as 200 to 250 barrels a day--a volume that is less than 0.1 percent of daily flow within the line. In this way, approximately 7.3 gallons of petroleum would be leaked per minute. What is the possible fate of this discharge?

By design, the bottom of the pipeline trench is to be doubly sealed and is presumed to be impermeable. Such "perfect" seals are, however, beyond the present "state-of-art." Moreover, in karst areas, extensive grouting programs are routinely conducted near spillways of dams to prevent leakage. Some of these programs have been spectacularly unsuccessful. At Amisted Dam, which impounds the Rio Grande near Del Rio, Texas, bedrock is karstic limestone. It is estimated that more cement was pumped into caves as grouting material than was used in the construction of the dam. Even so, the grout curtain was inadequate, and the new lake induced discharge from previously dry sites, thus creating new springs at numerous localities in Mexico.

64-9 In brief, I assume that this ghost leak would find avenues into the subsurface. As already mentioned, the terrain near the proposed pipeline is pitted with sinkholes, and caves are documented nearby. Such solution features and fractures associated with the 15 faults mapped across the pipeline route provide loci for transmission of oil through the vadose zone. Other avenues for downward migration are water wells. The conventional means of well completion in the area is to leave the borehole open. The rock is stable, and with open-hole completion, groundwater may flow into the well from any level. But pollutants may also enter open well bores, and oil from a slow pipeline leak might move laterally via porous strata and enter such wells, which would act as ongoing point-recharge features.

By whatever means, this petroleum would slowly move through the vadose zone, coating the pore spaces and leaving a film of oil that would continue to be leached by through-flowing waters. A considerable amount of oil could reach the water table before any loss is detected. And the likely means of detection would be only after a period of weeks, perhaps, as when the total volumes between input and output are found not to balance. Then more time would be required to find the leak, as it would have no surface manifestation. Under these conditions, 7,500 barrels of oil could leak into the subsurface within a month. Location of the leak could take weeks beyond the time that the leak is detected. Meanwhile, the oil would continue to spread through the

RESPONSE TO LETTER 64

64-9 Your comment regarding a suggested "Ghost Leak" scenario is noted. Please refer to the Modifications and Corrections section for page 4-6 for additional information on ghost leaks.

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64-9 Cont. vadose zone and into the aquifer. Thousands of barrels could enter the groundwater and subsequently disperse as a plume of pollution. Clean-up would depend on the use of a well screen and perhaps the employment of a flushing medium in the vadose zone.

In summary, there are several scenarios that could be considerably worse than the so-called worst-case scenario presented in the DSEIS. But irrespective of any disaster scenario, what is the likely impact on the aquifer? The DSEIS cites a 1967 reference that the threshold for taste and odor of crude oil in water is 0.1 to 0.5 mg/l. An analysis of more recent literature (Freeze and Cherry, 1979) shows this threshold to be 0.08 mg/l. Using the lower threshold, Raymond Slade of the U.S. Geological
64-10 Survey, in Austin, has shown that a spill of only 13 barrels of oil would cause the groundwater beneath the Onion Creek part of the aquifer--the part that supplys the City of Buda--to have detectable taste and odor (Raymond M. Slade, Jr., personal communication, 1987). Slade assumed even dispersion of the hydrocarbons within the aquifer; hence, the pollution effects could be more severe yet when considered as an undispersed plume.

This concludes my review. I have included an addendum on the next page that contains cited references. If you have questions, please call me at (512) 467-3509.

Sincerely,

Charles Woodruff, Jr.
Consulting Geologist

copy: James W. Collins

RESPONSE TO LETTER 64

64-10 Your comment regarding pollution of the Edwards Aquifer to taste and odor threshold levels is noted. Freeze and Cherry (1979) cited Ineson and Packham (1967) when stating the taste and odor threshold for commercial gasoline is less than 0.005 mg/l. We could find no reference to the taste and odor threshold for crude oil in Freeze and Cherry (1979). We therefore used Ineson and Packham (1967) as our source for the taste and odor threshold for crude. Please refer to Section 3.3 in the Modifications and Corrections section and Appendix B of the Final SEIS.

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ADDENDUM: REFERENCES

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Bureau of Economic Geology, 1985, The Guadalupe-Lavaca-San Antonio-Nueces River Basins Regional Study--San Antonio East-Llano East Sheets: The University of Texas at Austin Bureau of Economic Geology Maps, scale 1:250,000.

Freeze, R.A., and Cherry, J.A., Groundwater: Englewood Cliffs, N.J., Prentice-Hall, 604 p.

Hunt, R.E., 1984, Geotechnical Engineering Investigation Manual: New York, McGraw-Hill, 983 p.

Kier, R.S., Garner, L.E., and Brown, L.F., Jr., Land Resources of Texas: The University of Texas at Austin, Bureau of Economic Geology map, scale 1:500,000.

Rose, P.R., 1986, Pipeline oil spills and the Edwards aquifer, Central Texas in Abbott, P.L., and Woodruff, C.M., Jr., eds.: The Balcones Escarpment, prepared for Geological Society of America Annual Meeting, San Antonio, Texas, p. 163-183.

LETTER 65

COMMENTS ON DRAFT SUPPLEMENTAL
ENVIRONMENTAL IMPACT STATEMENT
PROPOSED ALL-AMERICAN PIPELINE PROJECT
JANUARY 1987

65-1 1. The BLM's selection of the Northern Route as the preferred alternative is considered to be the correct selection. This route does not cross the Edwards Balcones Fault Zone aquifer (Proposed Route), which is the most sensitive of the major and minor aquifers that are crossed. Selection of the Northern route also avoids the possibility of an oil spill in the vicinity of Fredericksburg (Proposed Route) which might contaminate water from the Ellenberger, which is essentially the sole source of water for the City of Fredericksburg. Furthermore, the Northern Route crosses fewer miles of the Edwards Plateau than the Proposed and Southern Routes. As noted later in comment 6, an oil spill or leak on the Edwards outcrop in Edwards and northern Kinney County (Southern Route) might cause serious damage to water from major springs in Kinney and Val Verde Counties, and this possibility could be avoided by using the Northern Route.

65-2 2. Information on the permeability and porosity of the aquifers and the hydraulic gradients in the aquifers is not included in the discussions of major and minor aquifers in the Draft Supplemental Environmental Impact Statement (DSEIS), which are all considered, by ERT definition, to be sensitive aquifers where the pipeline crosses the outcrops. These factors are pertinent to the rate of movement of ground water in the aquifers. Fluids do not move as rapidly through the interstices in the unconsolidated sand and gravel and sandstone in the Trinity, Carrizo-Wilcox, Gulf Coast, Queen City and Sparta aquifers as they do through cavernous limestones such as the Edwards aquifer. Thus, the types of materials in the aquifers and their permeability and porosity will control the rate of movement of spilled crude oil or dissolved constituents from the crude oil in the aquifer. Although inclusion of information on these parameters was requested at the scoping hearings, it was not provided in the DSEIS.

65-3 3. Discussions of movement of crude oil or constituents dissolved from crude oil entering the Edwards Balcones Fault Zone Aquifer in the DSEIS imply that the contaminants probably would not move rapidly or for large distances in the aquifer. The following discussion of the rate of movement of ground water in the Edwards Aquifer is from U.S. Geological Survey Open-File Report 83-537 titled "Carbonate Geology and Hydrology of the Edwards Aquifer in the San Antonio Area", Maclay and Small, 1984.

RESPONSE TO LETTER 65

65-1 Your comment regarding support for the Northern Alternative is noted.

65-2 Your comment concerning additional groundwater data is noted, please see the Modifications and Corrections section for pages 3-13, 3-14, and 3-125 and Table 3-1.

65-3 Your comment regarding rate of crude oil movement in the Edwards Balcones Fault Zone is noted. Please refer to Sections 3.2.2.1.3 (pages 3-8 and 3-9) and 4.2.2.3.3 (page 4-32, paragraph 4) of the Draft SEIS, which agree with your comment concerning rapid movement of groundwater through the Edwards Balcones Fault Zone recharge zone.

Ground-water velocities in the Edwards aquifer have been estimated or measured by several different methods. A gross estimate can be made for the confined freshwater zone on the basis of the estimated total volume of water stored in the confined zone of the aquifer, which is 19.5 million acre-ft (24,000 hm^3), and the approximate average annual recharge of 550,000 acre-ft (680 hm^3). The residence time for water in the confined zone is about 35 years. The average distance an increment of water from the confined aquifer west of Comal Springs would travel through the confined aquifer to Comal Springs during the 35 years is about 65 mi (105 km). Based on these values, the estimated ground-water velocity is about 27 ft/d (8.2 m/d).

65-3 Cont.

The distribution of trichlorofluoromethane, that served as a ground-water tracer in the eastern part of the San Antonio area, has been investigated by Thompson and Hayes (1979). They identified a plume of ground water containing trichlorofluoromethane that extends about 46 mi (74 km) from north San Antonio to San Marcos. Trichlorofluoromethane, which is a manmade compound used for industrial purposes, was first produced commercially in 1931. Therefore, the tracer has moved from its source to the sink in no more than 45 years, which is an average minimum velocity of 14.4 ft/d (4.4 m/d). It is far more likely, however, that the tracer was first introduced into the ground water during the past 10 to 15 years when use of the compound became more prevalent.

On the basis of tritium concentrations, Pearson (1973) estimated that the residence time for water in the freshwater zone of the Edwards aquifer to be greater than 20 years, and on the basis of carbon-14 data, estimated the residence time of waters in the saline water zone to be greater than several tens of thousands of years. Estimates of ground-water velocities, using Rhodamine WT dye, were made at several well sites within Bexar County. These estimates range from 2 to 31 ft/d (0.7 to 9.4 m/d) at the sites (Maclay, Small, and Rettman, 1981).

As shown by the above discussion of ground-water movement in the Edwards aquifer, the estimated maximum rate of movement might be as rapid as 4.6 miles per year. In comparison, ground-water velocities in sand and sandstone aquifers are generally less than a foot per day.

65-4 4. The probable worst case scenario for an oil spill near Onion Creek that is given in Appendix "C" to the DSEIS indicates that approximately 77 barrels of dissolved oil may enter the Edwards aquifer from Onion Creek and that 93 barrels may be lost to the subsurface in the vicinity of the spill. The probable fate of the oil entering the aquifer from the creek is described but the fate of the crude oil entering the subsurface at the spill site is not. Based on the assumption that about 42 percent of the crude oil is available for dissolution in water, as used for the oil in Onion Creek, then about 39 barrels of the 93 barrels lost to the subsurface in the vicinity of the spill would be dissolved. The ultimate fate of this crude oil should be addressed in the DSEIS.

65-5 The assumption that the 77 barrels of dissolved crude oil entering the Edwards aquifer from Onion Creek would be evenly distributed across the 102,200 acre-feet of water in the aquifer derived from Onion Creek is not realistic. Therefore, the assumption that the concentration of dissolved hydrocarbons in the water in the Edwards aquifer would be as low as 0.08 mg/l is not realistic. According to the scenario described in the DSEIS, the concentration of dissolved hydrocarbons in the 54 million gallons of water entering the Edwards aquifer will be about 50 mg/l. This plume of water will be diluted to some extent by dispersion and diffusion as it moves through the aquifer, but the concentration of dissolved hydrocarbons would not diminish to the 0.08 mg/l given in the DSEIS. Dilution by about 83,000 acre-feet (about 27 billion gallons) of water in the aquifer would be required to reduce the concentration to 0.1 mg/l, and dilution by about 17,000 acre-feet (5.5 billion gallons) of water in the aquifer would be required to reduce the concentration to 0.5 mg/l. Dilution to these concentrations, which are cited in the DSEIS as the threshold of unpalatable taste and odor in hydrocarbon-contaminated water, probably would occur only near the edges of the plume.

65-6 Depending on the position of the ground-water divide near Onion Creek in the vicinity of the Proposed Route at the time of a spill or a leak, the hydrocarbon contaminated water would move toward Barton Springs to the north or San Marcos Springs to the south. According to Slade (1986) there are 25 identified major well fields supplying water for municipal and industrial use, and several hundred other wells producing water from the Edwards aquifer between Onion Creek and Barton Springs. Thus, the plume of hydrocarbon contaminated water probably would be intercepted by the cones of depression of some of these wells as it moved toward Barton Springs, and the water from the affected wells would be unusable.

RESPONSE TO LETTER 65

65-4 The Onion Creek to Edwards Aquifer Oil Spill Scenario has been revised; please refer to Appendix B of the Final SEIS.

65-5 Please refer to the response to Comment 65-4.

65-6 Please refer to the response to Comment 65-4.

65-7 5. The January 1987, DSEIS is not consistent with the December 1986, DSEIS, which was released for internal review, with regard to the description of movement of oil from the May 1986 crude oil spill from a 24-inch pipeline operated by Shell Pipeline Corporation. The spill occurred in the Balcones Fault Zone near Austin, Texas. It is noted on page 4-25 of the December 1986 DSEIS that samples taken a few months after the spill from ground water discharging from a porous zone into a cave 2,800 feet from the spill site indicated that crude oil had penetrated the subsurface to a depth of 40 feet. This information was not included in the January 1987 DSEIS, and contrary to it, the Shell crude oil spill was used as an example that quick response to a spill can prevent infiltration of oil to the water table. The following statement is on page 4-28 of the January 1987 DSEIS: "For example, the May 1986 occurrence of a 2,300- barrel oil spill from the Shell Rancho Pipeline in the Edwards Balcones Fault Zone Aquifer was contained on the surface and in shallow recovery trenches within a two week period (Radian 1986a). As of December 1986, there was no subsequent infiltration of oil to the water table detected in monitoring wells."

65-8 The absence of oil in the monitor wells does not necessarily mean that oil did not infiltrate to the water table. It can just as well mean that the monitor wells are not in the right locations to intercept oil that has infiltrated to the water table, especially in a limestone aquifer. Investigation of this spill is still in progress and the final consequences from it are not fully known.

65-9 6. The DSEIS does not include information on water soluble constituents in the crude oil that are hazardous or toxic, or the concentrations at which such constituents would be hazardous or toxic. This information was requested at the scoping hearings.

65-10 It is noted (page 4-25) in the DSEIS that some components of the complex combination of hydrocarbons comprising crude oil are slightly water soluble, and small amounts of these components dissolved in water can result in noticeable taste and odor problems. Furthermore, the discussion states that danger to human health is uncommon in the event an oil spill affects a drinking water supply because the concentration of contaminants necessary to cause toxic effects is greater than the threshold of the unpalatable taste and odor of the hydrocarbon contaminated water.

The solution proposed for an occurrence of contamination is to turn to an alternate supply for affected municipal or domestic water supply systems before any health impacts due to sustained consumption of contaminated water could occur.

RESPONSE TO LETTER 65

65-7 Your comment regarding the discrepancy between the October 1986 preliminary SEIS and the January 1987 Draft SEIS involving sampling is noted. The January 1987 Draft SEIS deleted any mention of cave (40 ft below ground surface) sampling results because it was learned that proper sampling protocols were not followed during that sampling and therefore the sampling was ruled invalid. A subsequent sampling event at the same site failed to show any conclusive evidence of hydrocarbons present. Also please refer to the Modifications and Corrections section for pages 4-28 and 4-29 which no longer cites the Shell Rancho spill cleanup as an example of successful quick response, but rather as an example of the uncertainty involved in an oil spill cleanup. Also, please refer to the response to Comment 33-3 regarding clarifications of the discussion of the Shell Pipeline Corporation spill.

65-8 Thank you for commenting. We agree with your comment.

65-9 Please refer to the Modifications and Corrections section for page A-1 for information on the expected constituents in the oil.

65-10 Typically, municipalities have more than one source of water, that is they have more than one withdrawal point for water. A municipality that uses groundwater usually has more than one well, and a municipality that uses surface water usually has a reserve capacity which can supply water needs for one to four days, an alternative supply, or a tie-in with other suppliers. These back-up sources of water would be used in the event that the primary source of water became contaminated. If no back-up source of water is available or if all sources become contaminated, drinking water can be trucked in until the contamination is removed or an alternative water supply is developed.

Please refer to groundwater Mitigation Measure GW-3 in Appendix A for details of mitigation procedures for water supply wells.

65-10 Cont. The source of the alternate water supply is not given. Obtaining an alternate water supply could be difficult and time consuming, and the source or sources of an alternate water supply should be specified in the DSEIS.

7. The following statement is made in Section 3.2.2.2.1 on page 3-14 of the DSEIS. "The Proposed Route crosses the downdip extent of the Ellenberger-San Saba Aquifer approximately 5 miles south of Fredericksburg. Here this aquifer is overlain and confined by Hensell Formation which is composed of interbedded sand, silt, clay and conglomerate. Because the outcrop is not traversed by the Proposed Route or alternatives, the Ellenberger-San Saba is not considered to be a sensitive aquifer."

The City of Fredericksburg obtains its water supply from 5 wells south of the city, which withdraw water from the Ellenberger. The closest well is about 1,000 feet north of the Proposed Route and the well farthest from the pipeline is about 5,000 feet north of it.

65-11 As stated in the DSEIS, the Ellenberger is overlain by the Hensell Sand. In this area the Hensell is about 70 to 100 feet thick. Studies of the Ellenberger in the vicinity of Fredericksburg indicate that the principal source of recharge to the Ellenberger probably is by downward leakage from the overlying Hensell. Furthermore, a pumping test of one of the city's Ellenberger wells indicated there was a hydraulic connection between it and a nearby observation well that is screened in the Hensell.

The Proposed Route traverses approximately four miles of Hensell overlying the Ellenberger west of the City's wells. Thus, crude oil or dissolved constituents from crude oil entering the Hensell from a spill or leak along this segment of pipe line might eventually reach the Ellenberger and be drawn to the pumping wells. Therefore, it appears that the Ellenberger in this area should have been designated as a sensitive aquifer.

8. The section on ground water related to the Southern Alternative does not recognize that the outcrop of the Edwards aquifer traversed in Edwards and northern Kinney Counties provides part of the recharge that is discharged at Mud, Pinto, and Las Moras Springs in Kinney County. Additionally, 65-12 part of the water that was discharged from springs along Devils River before Lake Amistad was filled and water discharged from San Felipe springs at Del Rio in Val Verde County is from this source. Studies of the recharge and discharge relationships in Kinney and Val Verde Counties by Lowry (1955) and Bennett and Sayre (1962) indicate that this

RESPONSE TO LETTER 65

65-11 Please refer to the response to Comment 21-2.

65-12 Your comment regarding the hydrogeology along the Southern Alternative is noted. Please refer to revised Mitigation Measures GW-1 in Appendix A of the Final SEIS.

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65-12 Cont.

is the case. Crude oil, or constituents dissolved from the crude, from a spill or leak from the pipeline that may enter the Edwards aquifer outcrop in Edwards or northern Kinney Counties could eventually reach these points of discharge, and this possibility should be considered in selection of the route of the pipeline.

65-13

9. An inventory of water wells within two miles of the three proposed pipeline routes, that provides information on well owners, well depths, aquifers screened in the wells, use of water (domestic, stock, irrigation, public supply), static water levels, etc., was not included in the DSEIS. Conducting such an investigation is alluded to in the DSEIS in Section 4.7.2, Measure AW-1, where it is stated that detailed investigations will be conducted along the selected alignment, concentrating on sensitive aquifers and the remainder of the route because ground water may be locally important for domestic and agricultural uses. The scope of such investigations is described as definition of ground-water depth, recharge sources, properties of overlying soils, background water quality, and existing water uses. Such studies should have been made for inclusion in the DSEIS, as requested at the scoping hearings, so the data would be available for consideration in deciding which of the three routes should be selected.

65-14

10. The maximum recorded flow of the Pedernales River near Fredericksburg is shown to be 13,400 cubic feet per second (gage height 23.23 ft) in Table 3-6 on page 3-22 of the DSEIS. This is the maximum flood of record since the gaging station was established in July 1979. However, U.S. Geological Survey Water-Data Report TX 84-3 shows that the highest known discharge was 64,000 cubic feet per second June 1, 1979 (gage height 34.4 ft) and that the flood of August 2, 1978, which is the highest since 1907, reached a stage of 41.6 feet (discharge not determined), which would produce a discharge greater then 64,000 cubic feet per second. Thus, the highest known discharge of the Pedernales River near Fredericksburg is about 5 times larger than given in the DSEIS, and the highest recorded gage height would produce a discharge that is much larger than the highest known discharge. A thorough investigation to determine the probable maximum discharge should be made to assure that the pipeline crossing on the Pedernales River near Fredericksburg will be designed in a manner which will preclude washout at the maximum discharge expected to occur.

Joseph K. Longacre
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RESPONSE TO LETTER 65

65-13 Please refer to the response to Comment 64-2.

65-14 The summary tables of USGS flow records have been revised. Please refer to Tables 3-6, 3-41, and 3-60 in the Modifications and Corrections Section 3.2.

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RESPONSE TO LETTER 65

REFERENCES

1. Bennett and Sayre, Geology and Ground-water Resources of Kinney County, Texas, Texas Water Commission Bulletin 6216, 1962.

2. Lowry, Recharge to the Edwards Ground-water Reservoir, Consulting Engineering Report to San Antonio City Water Board, 1955.

3. Maclay, Small, and Rettman, Application and Analysis of Borehole Data for the Edwards Aquifer in the San Antonio area, Texas, Texas Department of Water Resources LP 139, 1981.

4. Pearson, The Evaluation and Application of C^{14} Dating of Ground Water, U.S. Geological Survey open-file report, final report, Army Research Office Project ARO-O No. 5830-EN.

5. Slade, Dorsey, and Steward, Hydrology and Water Quality of the Edwards Aquifer Associated with Barton Springs in the Austin Area, Texas, U.S. Geological Survey Water-Resources Investigation Report 86-4036.

6. Thompson and Hayes, Trichlorofluoromethane in Groundwater - A Possible Tracer and Indicator of Groundwater Age, Water Resources Research, Vol. 15, No. 3, June 1979.

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RESPONSE TO LETTER 66

March 20, 1987

Mr. William S. Haigh
Federal Project Manager
California Desert District
U.S. Department of the Interior
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Reference: Response to "Draft Supplemental Environmental Impact Statement, Proposed All American Pipeline Project," McCamey, Texas to Webster, Texas, January 1987

Dear Mr. Haigh:

This letter responds to your general invitation for responses to the above-referenced Impact Statement prepared for the Bureau of Land Management by the ERT Company. I reviewed the "high points" of my comments about the Draft SEIS in my presentation at the meeting in Fredericksburg, Texas, on March 5, 1987. However, I have prepared this letter to discuss my concerns more fully for the record.

Reference is made to my earlier letter to you of August 7, 1986, in which I listed and discussed 20 issues which I thought should be considered in the BLM's Draft SEIS for the pipeline project. In my August 7 letter, prepared for the scoping sessions, I enclosed my professional resume to establish my qualifications to assess these technical issues. In summary, however, I hold a Doctorate in Geology from the University of Texas at Austin and am a recognized authority on the Edwards limestone of the Edwards Plateau, Balcones Fault Zone, and Gulf Coast subsurface in Texas. I also have substantial experience in risk and uncertainty assessment in technical projects, and in the behavior of oil and water in carbonate reservoirs. My professional career in petroleum geology spans more than 25 years. I am a certified professional geologist. In the present matter I am acting on behalf of Travis, Hays and Gillespie Counties, and the City of New Braunfels, Texas. I am also acting as a concerned private citizen of Kimble County, Texas. I enclose an

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Mr. William S. Haigh
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offprint copy of a technical paper I wrote last year (Rose, 1986) concerning pipeline oil spills and the Edwards aquifers, which further elaborates and documents the vulnerability of those sensitive aquifers to pollution.

Although I acknowledge that ERT has discussed, in the Draft SEIS, some of the issues I raised in my August 7 letter, it is clear that many very important issues remain unaddressed, or inadequately addressed, and the following remarks are respectfully offered for your further consideration and treatment in the Final SEIS on this project.

1. **Realistic spill frequencies:**

Based on the historical record (1971-1985) of trunk pipeline oil spills in the Edwards Plateau, Hill Country, and Balcones Fault Zone region of Texas, considering all spills of 50 barrels or more, we should expect one spill per year per 1,020 line-miles of pipeline. This contrasts with ERT's estimate of 4.017×10^{-4} spills per mile-year for the All American Pipeline. This is the same as one spill per year per 2,489 line-miles of pipeline -- suggesting that the AAPL will be about 2.5 times safer than existing trunk lines. In an earlier AAPL version (McCamey to Freeport "Alternative EIS, January 1985) their estimate was even higher, equating to one spill per year per 3,300 line-miles of pipeline.

66-1 The cited justification for this projected improved safety is a massive EPA report on pipeline safety (Mastandrea, 1982), which attempts to set certain spill-frequency factors for pipelines as a function of age, diameter, inspection frequencies, etc. However, these factors were arbitrarily set by Mastandrea, and ERT's employment of these performance factors is clearly fallacious. In particular, some factors are essentially "counted twice." Also, it is interesting (but not reassuring) that all the employed factors (except the diameter factor) are "one-way" -- that is, all factors seem to make the AAPL **safer** than the "reference pipeline," which is clearly not an analogous model. For the 275-mile central route from McCamey across the Edwards Plateau, Hill Country, and Balcones Fault Zone, ERT predicts about 4 spills greater than 50 barrels in the 40-year life of the project. Based on the historical record, however, we should anticipate about 11 such spills in 40 years.

66-2 Also, an independent data set on spill frequency remains unutilized -- The record of faulty welds, damaged pipe, and failures during hydrostatic testing of the existing AAPL

RESPONSE TO LETTER 66

66-1 The Draft SEIS considered the historical data base referenced by the comment. The differences cited in your comment are due to the correction factors which account for the improved engineering of pipelines today when compared to older pipelines on which the historical records are based. Please refer to pages 4-10 through 4-13 of the Draft SEIS for the justification for choosing the Mastandrea statistical data as the basis for the spill frequency estimates in the Draft SEIS. Also see the response to Comments 63-5 and 63-6.

66-2 BLM personnel have been observing the construction of the Santa Barbara to McCamey segment of the pipeline. BLM's judgement is that there have not been an unusually high amount of faulty welds, hydrostatic test failures, etc. Those faults that have been detected were repaired, retested, and found to meet regulatory requirements and industry specifications.

The U.S. Department of Transportation (DOT) evaluated 66 weld radiographs of the All American Pipeline in July 1987. DOT's report of July 15, 1987 indicated that all 66 welds complied with API Standard 1104.

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66-2 Cont. between Santa Barbara and McCamey. Such data gives a good indication of how the completed pipeline will perform.

66-3 The reason this is important is that it elevates the likelihood of oil-spill pollution to a higher level in the area of sensitive cavernous carbonate aquifers. Moreover, it would appear more prudent to base environmental decisions on the observed historical record rather than than on untested and arbitrary adjustments to an unrepresentative analog.

2. **Realistic pressures and volumes of shipped crude oil:**

66-4 ERT did cover most of this topic adequately, especially recognizing maximum shipping rates of 450,000 Bbl/day, but did not indicate the pressures at such rates. Presumably the 1,468 maximum psig noted on p. 2-5 of the Draft SEIS somewhat exceeds highest shipping pressures planned for the pipeline!

3. **Types of materials allowed to be shipped:**

66-5 This question was ignored by ERT. The problem here is that no restriction is legally placed on AAPL as to types of liquids permitted to be transported. It is possible that, in the future, refined products might be shipped westerly in the pipeline, or that certain toxic chemicals might be transported. The environmental impact of spills of such materials **must** be considered.

4. **Realistic spill volumes:**

Although ERT did attempt to consider many of the factors identified in my August 7 letter, such as API gravity, shipping rate/pressure, etc., some significant errors or highly questionable assumptions remain:

66-6 a) The claimed 2.0 minutes in which the pipeline will be totally shut down is probably optimistic, compared with past spill-events in the area.

66-7 b) Size of rupture is variously given as a 12" split and a total severance.

66-8 c) The distance from nearest upstream block valve is not identified as the extremely important factor that it is in influencing spill-volumes.

RESPONSE TO LETTER 66

66-3 Since the Santa Barbara to McCamey segment of the pipeline is not operating, there is no historical record on this segment of the pipeline on which to base spill frequency estimates. The procedure used is judged to be the best available.

66-4 Please refer to the Modifications and Corrections section for page 2-5.

66-5 Please refer to the Modifications and Corrections section for page 2-1.

66-6 The pipeline accident response times used in the analysis are considered reasonable.

66-7 Estimated spill volumes at certain sensitive receptors were calculated for both a 12-inch diameter split and a complete 30-inch diameter rupture. Please refer to the Modifications and Corrections section for page 4-20 for a discussion of the methods used to make these estimates. Volumes of spilled oil for various important receptor locations are listed in Tables 4-9, 4-39, and 4-50 in the Draft SEIS.

66-8 The block valve locations are included in the spill estimates. Please refer to the response to Comment 66-7.

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66-9 d) The volume of oil spilling from a severed pipe by gravity flow is probably underestimated.

66-10 e) The average projected spill volume of the AAPL is significantly underestimated in comparison with the historical record (3,400 bbl vs. 6000 bbl). As noted previously, it would appear imprudent to base environmental decisions on untested and arbitrary adjustment factors, in the face of more pessimistic data from the historical record.

66-11 f) The impact of "ghost leaks" is ignored. This is a serious omission. The threshold for immediate detection of such leaks, based on national records of large pipelines, is about 0.3 percent of daily shipping volume (Mastandrea, 1982), but ERT claims (p. 2-31) the AAPL threshold would be 0.00096, or about 0.1 percent. The impact of such threshold "ghost leaks" is shown below:

Time increment	U.S. records (0.3%)	AAPL claim (0.1%)
Daily	900 Bbl	288 Bbl
Weekly	2,016 Bbl	6,300 Bbl
Monthly	8,064 Bbl	25,200 Bbl
Yearly	96,768 Bbl	302,400 Bbl

Clearly, small but persistent ghost leaks which remain undiscovered for some months -- as many do -- pose a significant threat to aquifer-pollution, particularly in areas where bedrock is fractured and cavernous, and in remote, sparsely populated areas where leaks may go unnoticed for long periods.

From a systems point of view, "ghost leaks" are troublesome because they commonly take so long to correct: a volumetric shortfall may take several months to confirm after natural shipping variations are resolved and meter accuracy is verified. Thereafter, the location of the leak must be ascertained, which also requires much time and effort. Finally, "ghost leaks" may deteriorate to catastrophic pipeline failures in some cases.

RESPONSE TO LETTER 66

66-9 Gravity flow from the pipe is accounted for in the calculations by using the elevation profile of the pipe. Please refer to the Modifications and Corrections section for page 4-20.

66-10 Please refer to the response to Comment 66-1.

66-11 Information concerning chronic low-volume oil leaks is presented in the Modifications and Corrections section for page 4-6.

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5. **Planning for spill-response and cleanup:**

Appendix B of the Draft SEIS is a good beginning on this topic. However, several items require more attention:

66-12 a) Manually operated shut-off valves in the Edwards Plateau represent an unacceptable concession to economics, and the postulated 72 minute interval projected by ERT to travel to remote shut-off valves and manually close them is both optimistic and irresponsible, particularly in light of the sensitivity to pollution of the cavernous Edwards Plateau aquifer. All shut-off valves should be electrically operated from a central control station, and they should be more closely spaced than in the 190-mile segment between the McCamey and Mountain Home pump stations (one every 24 miles).

66-13 b) Conspicuously absent from Appendix B is any realistic plan for dealing with pollution of the Edwards aquifer once spilled oil has in fact percolated through the porous bedrock and reached the water table.

66-14 c) The extent and readiness of spill-response contingency measures are welcome, but must, in reality, be recognized for what they are: **words on paper.** How can we be sure that AAPL will, in fact, maintain such response systems and crews?

6. **Realistic projected recoveries of spilled crude oil:**

66-15 This has not been specified in the Draft SEIS although the "worst-case" scenario (Appendix C) suggests about 46% recovery of spilled oil. Texas spill records indicate 40% to 50% as an expectable average, although it appears to be highly variable. This leads to the natural question: "What are the variables affecting oil-spill recovery?" I noted this concern in item 6 of my August 7 letter, but I don't believe ERT really addressed the matter.

7. **Threshold size of aquifer-polluting oil spills:**

66-16 Again, this is an important figure which ERT does not address. In testimony before the Committee on Environmental Affairs, Texas Legislature, on March 13, 1986, an AAPL official testified that about 4,500 barrels was the threshold spill-size that had the potential of reaching and polluting the Edwards aquifer. At the same hearing, and in

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66-12 The AAPL proposal includes four remote-control valves rather than manual valves at the Edwards Aquifer recharge zone. The 72-minute closure time is an estimated average for all valves and does not apply to the aquifer. Block valve spacing has been judged to be adequate. Some additional valves are specified in Mitigation Measure SS-2 (in Appendix A) where the pipeline crosses sensitive resources.

The BLM's overall goal in Mitigation Measure SS-1 is to have an oil response team on-site within one hour of notification. In areas where this is impossible and where sensitive resources are at risk, remote-control block valves will be installed as delineated in Mitigation Measure SS-2.

66-13 Groundwater cleanup measures described on page B-43 of the Oil Spill Contingency Plan in the Draft SEIS can be used to an extent on the Edwards Aquifer. However, because the aquifer has large solution cavities and channels, the effectiveness would be low. The Oil Spill Contingency Plan will be implemented under the review of the BLM, DOT, and TWC. The initial plan will be reviewed and approved by these agencies, and the Oil Spill Contingency Plan will be updated annually.

66-14 Your concern regarding this issue is noted. Please refer to the response to Comments 18-3 and 66-13.

66-15 Your comment regarding variables affecting oil spill recovery is noted. EPA Emergency Response Branch personnel indicate, as a generalization, 10 percent of crude is soluble, 20 percent volatile, 10 to 20 percent lost on vegetation and banks, and 40 to 50 percent recovered. Variables affecting oil spill recovery for surface water include spill size, rate of movement of surface water, response time of cleanup crews, variations in terrain and vegetation, and properties of spilled crude. Variables affecting oil spill recovery from groundwater include spill size, depth to groundwater, nature of aquifer (porous media versus fractured media), rainfall events, response time of cleanup crews, variations in terrain and vegetation, and properties of spilled crude.

66-16 Your comment regarding the threshold size of aquifer-polluting oil spills is noted. In the cited references we agree that there are significant differences between the AAPL representatives' quote of 4,500 barrels and that of P. R. Rose's estimate of 1,000 barrels for the threshold spill size, having the potential of reaching and polluting the Edwards Aquifer. Please refer to the Modifications and Corrections Section 3.3 for Appendix A Section 1.5.

Your comment regarding the Shell Pipeline Company oil spill of May 27, 1986 on the Circle C Ranch in Travis County is also noted. We agree that data from this oil spill is pertinent and should be applied when referring to potential aquifer contamination. Please refer to the response to Comment 33-3.

Your comment regarding the hypothetical oil spill over the Edwards Fault Zone is also noted. As a matter of clarification, the 77 barrels of crude hypothetically introduced into the Edwards Aquifer consisted of dissolved constituents drawn out of the crude oil and introduced to the groundwater. The scenario has been rewritten and is presented in Appendix B of the Final SEIS.

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66-16 Cont.

a subsequent publication (Rose, 1986), I indicated that 1000 barrels was an appropriate threshold size.

A subsequent 2,300 barrel oil spill from the 24-inch Shell Rancho pipeline over the Edwards Fault Zone aquifer in southwestern Travis County on May 27, 1986, provides independent perspective on this question. Although it has not yet been demonstrated that spilled crude oil did in fact reach the water table in the Edwards aquifer, it is known that crude oil penetrated at least 40 feet downward into the bedrock, and that hydrocarbon gases spread internally more than one mile from the spill site. Finally, in ERT's Draft SEIS, their so-called "worst-case" scenario for a hypothetical oil spill over the Edwards Fault Zone aquifer, indicates that at least 77 barrels of crude oil could reach and contaminate the Edwards aquifer from a 3,230 barrel oil spill.

8. **Physical effects of crude oil contamination of the Edwards Aquifer:**

66-17

These concerns were raised in item 8 of my August 7 letter, but have not been adequately covered in the Draft SEIS, especially as regards the Edwards Plateau aquifer. The so-called "worst-case" scenario (Appendix C) deals with some of these issues in relation to a specific locality and event in the Edwards Fault Zone aquifer. In general, however, ERT's treatment of these unique cavernous carbonate aquifers is superficial and irresponsible, and constitutes one of the major shortcomings of the Draft SEIS: **The Edwards aquifers are unique and must be dealt with differently than any conventional aquifers.**

9. **Cost of cleanup, and who will pay?**

66-18

This is another important concern to area residents and a major flaw in the Draft SEIS. It is well and good to review spill-response contingency measures, but those are, after all, just words on paper. Residents want real assurance as to who will pay (and how promptly) for cleanup measures, obtaining alternate water supplies, etc. Please refer back to item 9 in my August 7 letter to you.

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66-17 Your comment regarding the physical effects of crude oil contamination of the Edwards-Trinity Plateau Aquifer is noted. A detailed survey of groundwater resources of the Edwards Plateau Region was conducted. Please refer to the Modifications and Corrections section for pages 3-8 and 3-114.

66-18 Your comment regarding financial liability for oil spill cleanup is noted. EPA Emergency Response Branch personnel indicated that financial liability for oil spill cleanup lies with the responsible party. If AAPL were deemed the responsible party in an oil spill incident, cleanup costs would be their responsibility. Please refer to the response to Comment 18-3.

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10. **Health effects of contaminated Edwards water supplies:**

66-19 This topic is also conspicuously absent from the Draft SEIS. In particular, the human health consequences of soluble hydrocarbon components, such as the benzenes and certain heavy metals in drinking water, should be addressed. In addition, ERT should have considered the impact of Federal minimum water standards criteria in regard to potential contaminating spills.

11. **Comparison of spill-consequences among all three routes:**

66-20 Still another glaring omission from the Draft SEIS is that there is no comparison of aquifer-susceptibilities among the three routes, or of costs of damage and correction, or of numbers of people impacted. Again, some of this shortcoming goes back to ERT's failure to distinguish between the unique cavernous aquifer of the Edwards Plateau and other more typical sandstone aquifers.

12. **Comparison of construction costs for all three routes:**

66-21 Nowhere have I found a careful documentation of this important consideration, particularly taking into account the 125-mile segment of the northern alternative route across Tom Green, Concho, Coleman, Brown, and Mills Counties in which soft shales and sandstones would allow rapid trench excavation. This would contrast sharply with trenching by saws and blasting in resistant Edwards limestones of the central and southern routes.

13. **Northern route could be shortened by 20 miles:**

66-22 I continue to be puzzled as to the need to extend the northern alternative route so far north into Coleman and Brown Counties. If the northern route passed approximately due east across northern McCulloch and San Saba Counties, and southern Mills County, it would cut off nearly 20 miles from the 546-mile length presently projected by AAPL. In addition, such a route would intersect the existing Amdel pipeline right of way in western Coryell County, to which it presumably could then be placed adjacent in the 50-mile segment across Coryell and Bell Counties before turning southward about ten miles east of Temple, Texas.

RESPONSE TO LETTER 66

66-19 Your comment regarding health effects is noted. Please refer to Modifications and Corrections Section 3.3 for Appendix A Sections 1.1 and 1.4 for further discussions on crude properties and health effects.

66-20 Your comment regarding the oil spill consequences among the three routes is noted. Please refer to the Modifications and Corrections for page 2-42.

66-21 AAPL has not conducted detailed rock mechanics surveys necessary to accurately compare the construction costs of the three different routes relative to geologic considerations.

66-22 Your suggestions for variations in the Northern Alternative are noted. When we developed the Northern Alternative, our goal was to identify a route that passed north of the fault zone aquifer, and that was viable from a pipeline construction perspective. AAPL feels that the route presented in the Final SEIS is reasonable and viable. AAPL has not indicated that it would benefit from a shorter route somewhat to the south of the Final SEIS alternative. We are not aware of any significant environmental advantages that would be gained by a more southerly alignment. Your suggested route would cross the Colorado River southwest of Goldwaithe. We are somewhat concerned that this would be considerably closer to the Highland Lakes reservoir chain, particularly Lake Buchanan.

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66-22 Cont.

This route would still be north of the northern extent of the subsurface Edwards Fault Zone aquifer in Bell County. In addition, it would be north of the Hickory, Ellenburger and Marble Falls aquifers where they crop out on the north flank of the Llano Uplift. Although this route would overlie areas where these aquifers are present as deep confined aquifers, it is not possible to charge confined aquifers from spills directly above them because of the pressure differential and because of hydrocarbon buoyancy.

In addition, such a route would be nearly 10 miles farther south of the proposed Stacy reservoir and the City of Brownwood than the proposed northern route, and it would not impinge on Bald Eagle nesting grounds at the head of Lake Buchanan, as claimed by AAPL representatives.

66-23

14. **Edwards Plateau aquifer ignored:**

In my opinion, the single most important flaw in ERT's Draft SEIS is their failure to consider the Edwards Plateau aquifer, especially its vulnerability to oil-spill pollution and the resulting devastating impact on the agricultural and recreational economy of the area in Crockett, Sutton, Kimble, and Gillespie Counties. We have emphasized repeatedly that there are two Edwards aquifers, one of wide expanse forming the sparsely populated Edwards Plateau, and the second forming a narrow fault-bounded band in the densely populated San Marcos-Austin corridor. We have emphasized that both are composed of cavernous, highly transmissive Edwards limestone. We have emphasized that spring-fed streams issuing from the Edwards Plateau flow into the Colorado, Pedernales and Blanco Rivers, and the Highland Lakes. ERT seems to simply dismiss the Edwards Plateau aquifer as just another conventional aquifer.

66-24

In the Draft SEIS, ERT gives short shrift indeed to the vulnerability of the Edwards Plateau aquifer and the consequences of a catastrophic spill in that area. They prepared a so-called "worst-case" scenario for the Edwards Fault Zone aquifer but not for the Edwards Plateau aquifer. This glaring omission is difficult to understand -- certainly, it would seem that the wide extent of the Edwards Plateau aquifer (about 200 miles along the proposed central route) would constitute a major reason, at least as important as the protection of the Edwards Fault Zone aquifer, for choosing another route. It is hard to avoid the speculation that sparse population, and therefore less political power, might have had something to do with the

RESPONSE TO LETTER 66

66-23 Your comments regarding the lack of detail concerning the Edwards-Trinity Plateau Aquifer are noted. Please refer to the response to Comment 66-17.

66-24 Your comment regarding an additional oil spill scenario is noted. Please refer to the Modifications and Corrections section for page 3-114 for additional information on the Edwards Plateau Aquifer. However, we do not feel that a catastrophic scenario is necessary for this aquifer. While it is one of many areas with sensitive areas crossed by the three routes, it is unlikely that a catastrophic study would reveal any significant new facts. We feel that the effort to develop a credible scenario was warranted for the more sensitive fault zone aquifer, where a spill could affect a far greater number of persons.

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66-24 Cont. insensitivity of ERT to this unique region! But, in any case, concerned citizens of the Edwards Plateau region may wonder why they are not entitled to equal protection.

15. **Cost effectiveness of design alternatives to improve pipeline safety:**

66-25 In my August 7 letter, I recommended that ERT carry out an exercise which examined the cost-effectiveness of additional pipeline design features that could significantly reduce spill volumes, and/or improve spill recoveries. Some design alternatives have been proposed for the fault-zone aquifer, but not for the Edwards Plateau aquifer. I find nothing in the Draft SEIS which responds to my suggestion.

16. **Census of springs and water wells:**

66-26 I recommended a census of springs and water wells along the proposed and alternate routes in my August 7 letter. In ERT's report, I find only a highly superficial, incomplete list of springs (Table 3-3) and no census of water wells along the route. Such features are primary candidates for damage in the event of a large spill.

17. **Direction of "pollution-plume" in Edwards Plateau aquifer:**

66-27 Although I recognize ERT's efforts to "model" a polluting "worst-case" spill for the Edwards Fault Zone aquifer, no such effort was made for the Edwards Plateau aquifer (see item 14, this letter).

18. **Restoration of right-of-way following construction:**

The Draft SEIS covers in detail (p. 2-19 to p. 2-25) the procedures for cleaning and restoring right-of-ways as I had suggested in my August 7 letter. However, two important questions still remain:

66-28 1) What are the guarantees that AAPL will, in fact, perform as the Draft SEIS assures us they will; and

66-29 2) Approximately one-half of the excavated rock and soil will remain following emplacement and burial of the pipeline -- what will be done with all that material?

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66-25 Various mitigation measures have been proposed to reduce significant impacts along all areas of the proposed and alternative routes. Please see recommended Mitigation Measures in Appendix A.

66-26 Your comment regarding a census of springs and water wells is noted. Please refer to revised Table 3-5 of the Modifications and Corrections Section 3.2 and revised Mitigation Measure GW-1 in Appendix A.

66-27 Your comment regarding the direction of contaminated groundwater movement in the Edwards Plateau Aquifer is noted; please refer to the response to Comments 66-17 and 66-24.

66-28 Under the terms of the court settlement, the BLM has responsibility for enforcing the mitigation measures described in the Final SEIS and ensuring the pipeline is designed and constructed in a safe manner. Other regulatory bodies such as the DOT also have enforcement powers over AAPL concerning design, operations, and maintenance.

66-29 Rock will be disposed of on private property under individual agreements with landowners.

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19. **Corporate relationships impacting pipeline safety:**

66-30 In my August 7 letter, I pointed out that corporate organization patterns and relationships may contribute toward or detract from a high-safety installation, and I suggested that ERT prepare a section of the report examining AAPL's construction history, organization, and accountabilities with regard to their pipeline, especially including the already completed California to McCamey segment. Nowhere do I find such a discussion.

20. **Comparison of hazards and costs of alternative routes:**

Table 2-12 of the Draft SEIS represents a significant effort to synthesize, tabulate, and compare the more important factors of the three routes and is helpful in summarizing the reasons for preferred routing. However, several glaring errors and/or omissions weaken Table 2-12; if these gaps were filled, I believe BLM's tentative preference of the northern alternative over the proposed central route would have been much more compelling. Some of those errors and omissions, not previously discussed, are reviewed below:

66-31 a) The City of Junction (population 2,500) derives its municipal water supply from a lake formed by damming the South Llano River. This lake is approximately ten miles downstream from where AAPL proposes to cross the South Llano River. I find no consideration of this hazard or its apparent consequences, in the Draft SEIS.

66-32 b) There is no "worst-case" scenario for a pipeline oil-spill impacting the Edwards Plateau aquifer. I have taken the liberty of preparing such a scenario for your consideration (see Appendix).

66-33 c) The so-called "worst-case" scenario cited by ERT for a hypothetical oil spill over the Edwards aquifer in the Balcones Fault Zone is clearly **not** a worst case scenario. ERT's scenario is filled with errors and faulty assumptions, shows unrealistic bias in favor of the AAPL, and should be re-written in its entirety. For example, it is hard to take seriously a postulated "worst-case" spill of 3,230 barrels from the 30" AAPL in the face of a documented 25,200 barrel spill from the 18" Exxon pipeline in Kimble County in 1979.

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66-30 Your concern regarding this issue is noted. BLM was the compliance authority on federal lands and DOT was the authority in all areas.

66-31 The South Llano River is specified for a remote-control valve in Mitigation Measure SS-2 in Appendix A.

The City of Junction obtains its municipal water from a small impoundment on the South Llano River within the Junction city limits. Table 2-12 does not need to be revised since the Town of Llano had been identified as a downstream municipal water user. However, Table 4-12 has been revised (see Modifications and Corrections section for page 4-38).

66-32 The scenario you have submitted is noted. Please refer to the response to Comment 66-24.

66-33 The estimated spill size used in Appendix C of the Draft SEIS accounted for site-specific factors such as remotely operated block valves. Please refer to the Modifications and Corrections section for page 4-20 for details of the spill calculations. The comparison to the referenced 1979 spill is not appropriate because the All American Pipeline design includes several spill volume mitigation measures which were not in effect at the time of the 1979 rupture. Appendix C of the Draft SEIS has been revised, please refer to Appendix B of the Final SEIS and the response to Comment 1-1.

LETTER 66

66-34 d) ERT claims (p. 4-28) that "despite the large number of spills which have occurred over many decades of pipeline operations, no documented case of groundwater contamination caused by crude oil could be found." This statement is palpably erroneous. A well-documented account of such a polluting pipeline oil spill was provided by Roy W. Hann for a chronic leak in Coke and Runnels Counties in 1979 (see Hann's March 5 letter to you). In addition, the 1986 spill from the Shell (Rancho) pipeline in southwestern Travis County has not been vigorously followed up by the operator or the Texas Railroad Commission, so that we simply do not yet know whether hydrocarbons have reached the water table. It is known that hydrocarbons have penetrated at least 40 feet down into the bedrock (only about 60 feet above the groundwater table) and hydrocarbon gases have spread laterally in the subsurface at least one mile from the spill-site. In a probabilistic sense, many knowledgeable geologists would expect that some of the spilled hydrocarbons have indeed reached the Edwards aquifer and spread out on top of the water table. Naturally, the amount of such hydrocarbons may be small -- certainly, they are not known.

66-35

66-36

66-37 e) The Draft SEIS dismisses (p. 4-43) the potential for damage to the Caverns of Sonora by blasting during pipeline construction because "the 1-mile separation between the route and the caverns would substantially damp out blasting-induced vibrations." This is highly speculative.

66-38 Mr. Haigh, I concluded my August 7 letter to you by stating my belief that a thorough, objective, and professional assessment of the issues would produce a compelling rationale for adopting the northern route for All American's proposed new pipeline. ERT has now prepared a substantial Draft SEIS, and the U.S. Bureau of Land Management has indicated a slight preference for the northern route.

I am convinced that, if ERT will now consider and respond to my comments on their Draft SEIS, the Bureau of Land Management will, in the Final SEIS, declare a compelling preference for the northern route for the All American Pipeline.

RESPONSE TO LETTER 66

66-34 Your comment regarding documented cases of groundwater pollution by an oil spill is noted. Please refer to the response to Comment 20-6.

66-35 Your comment regarding the Shell Pipeline spill in Travis County, Texas is noted. Please refer to the response to Comments 33-3 and 65-7.

66-36 Your comment regarding hydrocarbons reaching the Edwards Aquifer and spreading on top of the water table is noted. Please refer to Modifications and Corrections Section 3.3 for Appendix A Sections 1.2 and 1.3 for discussions of migration of crude in fractured media as opposed to porous media.

66-37 (1) Mitigation Measure G-3, Page 4-181 of the Draft SEIS clearly states that special construction procedures will be employed within 2 miles of the Caverns of Sonora. These procedures are stated to be based upon mechanical ripping.

Limestone, being a relatively soft, tabular formation and generally highly fractured or weathered near the surface, lends itself well to mechanical ripping. This is a procedure that has seen extensive application, and its effects due to vibration, etc., are known to be small in magnitude and minor in terms of affected area (on the order of tens of feet).

(2) Trench excavation by blasting can be accomplished without damage to the canverns of Sonora; however, Mitigation Measure G-3 would not permit the blasting method. If blasting were to be permitted within the 2-mile vicinity of the Caverns of Sonora, proper blast design would effectively eliminate damage concerns, particularly with a 1-mile buffer zone, as specified. Blasting damage, usually suspected to be due to the magnitude of particle acceleration, is equally dependent on frequency. For a given amplitude, acceleration is proportional to frequency, and thus, small, high frequency vibrations are less likely to damage a structure than are longer, low frequency vibrations producing the same acceleration. Any blasting required in sensitive areas can be designed around these principles. Furthermore, it must be considered that fractures and discontinuities within the limestone strata will serve to inhibit propagation intensity. Dissipative attenuation will be relatively large in this type of blasting (trenching) due to these fractures/discontinuities, as well as nearness to the surface and intended direction of throw.

66-38 Your comment regarding support of the Northern Alternative is noted. Please refer to Modifications and Corrections Section 3.4.

LETTER 66

Thank you for your consideration.

Respectfully,

Telegraph Exploration, Inc.
Peter R. Rose, Ph.D.
President/Certified Professional Geologist

Enclosures:

Appendix: Worst Case Scenario for a Catastrophic Pipeline Oil-Spill, Edwards Plateau Area

Copy of Rose (1986) Pipeline Oil Spills and The Edwards Aquifer, Central Texas

RESPONSE TO LETTER 66

LETTER 66

APPENDIX:

WORST-CASE SCENARIO FOR A CATASTROPHIC
PIPELINE OIL-SPILL, EDWARDS PLATEAU AREA

Careless handling and shipping measures result in a small spot of metal fatigue on a segment of double-weld pipe that is laid and buried near mile post 143, about five miles west of where the AAPL crosses South Llano River ten miles south of Junction, Texas. This is a remote ranching area not frequented by passersby. This small flaw is not detected during hydrostatic testing, but about two years after completion of pipeline construction, a pinhole-sized leak develops, giving rise to a chronic "ghost leak" of about four barrels per hour. Unfortunately, the "ghost leak" is located over a zone of fractured, cavernous Edwards limestone, and all of the oil, confined under the trench overburden, drains downward into the cavernous limestone, reaching the water table about 120 feet below the surface.

The relatively small size of the leak -- about 100 barrels per day -- is well below the threshold of detection by AAPL's central control facility, and the existence of a leak is only recognized after three months, during which time 8,640 barrels of crude oil have seeped downward into the Edwards bedrock to the top of the water table. During the fourth month, gauges are tested and verified to ascertain that the leak is real and not the result of faulty metering. Then the search for the ghost leak commences.

66-39

Meanwhile, the spilled oil spreads laterally on top of the subsurface water table, and soluble toxic hydrocarbon compounds become increasingly abundant in the water. Five water wells become contaminated and 350 cows, 600 ewes, and 500 Angora nannies abort their fetuses. Investigating authorities begin to "hone in" on the site and nature of the problem.

After about 3 1/2 months, the small hole in the pipe abruptly enlarges to an 18" split and then a full rupture late on a Saturday night. Crude oil emerges under pressure at the rate of about 300 barrels per minute, since the pipeline is operating at maximum pressure and volume, namely 1,300 psi and 450,000 barrels per day. Because of newly-trained personnel, indecisiveness, and unclear operating instructions, pumping continues for five minutes and then gradually shuts down, which requires another five minutes. During this time, 3,125 barrels of crude oil are spilled. The spill site is about 13 miles from the nearest upstream block valve, which is a manually operated valve, and approximately 20,000 barrels flows out of the rupture during the three hours it takes to get a crew into the remote location, shut off the manual block valve, and find the leak in the darkness.

RESPONSE TO LETTER 66

66-39 Your comment regarding an alternate catastrophic oil spill scenario is noted.

Meanwhile, a steady rain has begun, and much of the 23,000 barrels of oil is washed downslope into Kyak Creek. This oil-laden water reaches the South Llano River 6:00 a.m. Sunday morning. Because of the narrow, rocky character of the river bed and the distance from AAPL's spill-response station in Austin, it is not possible to deploy booms and vacuum trucks in a timely and effective manner, and the first oil slick is detected on Lake Junction, from which the City obtains its municipal water, by 6:00 p.m. Sunday night. The municipalwater plant is shut down by State authorities at 8:00 a.m. Monday morning. Meanwhile, the All American pipeline is repaired and back in profitable operation by noon on Monday.

Water supplies are now hauled overland from Kerrville, 50 miles to the southeast for four days, at a cost of $60,000. In the meantime, an alternate intake is extended to the North Llano River, which can supply half of the required water, at a cost of $70,000. An emergency holding pond is constructed on the South Llano River just upstream from the mouth of Kyak Creek, and a temporary pipeline is constructed from Junction to the holding pond to bring uncontaminated water to the municipal water plant. This costs $200,000. Cost of water hauling during this period is another $60,000.

66-39 Cont.

Testing of water wells and springs now commences and it is found that crude oil has spread on top of the subsurface water table over an area of 16 square miles. Four major springs, including the Rio Bonito and Fred Coleman springs, are contaminated. Because groundwater flow is southeasterly here, contaminated spring water flows into the South Llano River upstream of the emergency holding pond, forcing another three mile southwesterly extension of the temporary pipeline plus construction of a new holding pond. This costs another $100,000.

Seven ranches are now without water, forcing the sale of all livestock; eventually these ranches are sold as their operators cannot sustain the financial burden. Naturally, they are sold at distressed prices because of the water pollution problem.

All major springs continue to flow contaminated water into the South Llano River for five years before trace levels of soluble hydrocarbons begin to diminish; flow of pure water does not return for 12 years. Downstream of Kyak Creek, the Walter Buck State Park is forced to close, and remains closed for four years. Federal water standards force the closure of Lake Junction for three years, and the Junction municipal water plant finally resumes normal operations five years after the spill occurred. Groundwater pollution (toxic levels) around the spill-site persists for a total of 12 years, eventually covering a subsurface area of 25 square miles.

LETTER 66

66-39 Cont.

The financial demands occasioned by this spill event quickly exhaust resources of the City of Junction and Kimble County. They then turn successively to the State of Texas and to the Federal Government. Nevertheless, affected private citizens expend a total of $800,000 in various efforts to promptly secure reliable supplies of fresh water. Several lawsuits are filed to recover damages from the All American Pipeline Company, even though pipeline personnel have been fully cooperative in trying to alleviate spill effects. No insurance policy or bond existed against such an event, and all damage claims are eventually settled through litigation five years after the spill. Total physical damage is estimated at $7,000,000; real estate losses are $6,000,000; and another $20,000,000 of tourist and recreational business is lost during the five year period. Average recovery of damages is 40 cents on the dollar.

PIPELINE OIL SPILLS AND THE EDWARDS AQUIFERS, CENTRAL TEXAS

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ABSTRACT

Shallow-marine shelf carbonates of the Lower Cretaceous Edwards Group form two important aquifers in central Texas. Both are fractured, cavernous, and highly transmissive. On the Edwards Plateau, the Edwards Group forms a simple, widespread, unconfined aquifer that is the water source for most streams, upland ranches, and many towns. In the Balcones fault zone, the Edwards forms an unconfined aquifer which is recharged by area streams where they cross the Edwards outcrop, and an adjacent confined aquifer farther downdip where the Edwards is overlain by impervious younger formations. The fault-zone aquifer is the main municipal water supply for San Antonio and many other smaller towns, and also provides much of the agricultural and recreational water for the region.

The Edwards is exceptionally vulnerable to pollution from pipeline oil spills, because its high permeability allows spilled crude oil to sink into the bedrock before cleanup crews have time to recover it. Thereafter, moving ground water and irregular pore distribution make recovery operations ineffective. It is estimated that oil spills larger than 999 barrels have the potential for reaching and contaminating the Edwards aquifers. On the average, 40 to 50 percent of spilled oil is recovered in cleanup operations.

The region is crossed by nearly 4,000 miles of pipelines, including small-bore gathering systems, product pipelines, and large-bore trunk pipelines (which pose the greatest hazard because they tend to incur larger spills). In the counties of the Edwards Plateau, Hill Country, and Balcones fault zone, 33 oil spills larger than 999 barrels have been reported since 1971. The largest was 25,200 barrels. Most of the 33 spills were from 10 trunk pipelines, having 10- to 24-inch diameters.

Two proposed large-bore (30 and 42-inch diameter), high-pressure pipelines pose new danger of aquifer pollution. Although the average spill from 30-inch pipelines is about 6,000 barrels, reasonable spill scenarios suggest that spills may commonly be much larger, and conventional mechanical safeguards proposed for such "mega-pipelines" may be inadequate to counter the higher pressures and volumes.

Suggested measures to help protect Edwards aquifers from future oil-spill pollution include:

1. Selective retrofitting of older existing pipelines.
2. Closer spacing of block-valves.
3. Electronically-linked hydrocarbon sensors.
4. Centralized shutdown systems.
5. Establishment of continuously staffed "spill-response stations," strategically located near especially vulnerable areas along the pipeline route.
6. Approval of proposed pipeline routes by the Texas Water Commission, prior to construction.

Additional crude oil pipeline construction over the Edwards aquifers seems imprudent, and an alternative northern route appears much more sound from an environmental viewpoint.

INTRODUCTION

Most of the drinking, agricultural, and recreational water supplies of central Texas come ultimately from highly porous limestone and dolomite aquifers in the Lower Cretaceous Edwards Group. Public awareness of the vulnerability of these aquifers to contamination has been growing in the region for more than 20 years. It reached new heights in late 1985 and early 1986 as a result of the proposal by the All-American Pipeline Company to build a large-bore, high-pressure, heated crude oil pipeline across about 300 miles of combined Edwards outcrop and watershed of streams recharging Edwards aquifers. In trying to make an objective assessment of potential risks posed by the All-American pipeline, it has also been necessary to analyze hazards represented by existing crude oil trunk and products pipelines in the region.

This paper has three purposes:

1. To assess the risk of large oil spills that have the potential to pollute Edwards aquifers.
2. To examine the effects and consequences of aquifer contamination by petroleum liquids from a geological perspective.
3. To recommend measures for reducing potential for pollution of Edwards ground water by oil pipelines.

REGIONAL SETTING AND DEPOSITIONAL HISTORY OF EDWARDS GROUP

A thick succession of resistant, flat-lying, porous, Lower Cretaceous limestone and dolomite, known traditionally as "Edwards," covers much of west-central Texas and composes one of the dominant physiographic elements of the State, the Edwards Plateau (Rose, 1972). Along the northwestern edge of the Gulf Coastal Plain, in the Balcones fault zone, the Edwards is also exposed in fault blocks, where it has been severely altered by ground water. South and east of the Balcones fault zone, the Edwards dips gulfward beneath the coastal plain, reaching depths of 15,000 to 20,000 ft.

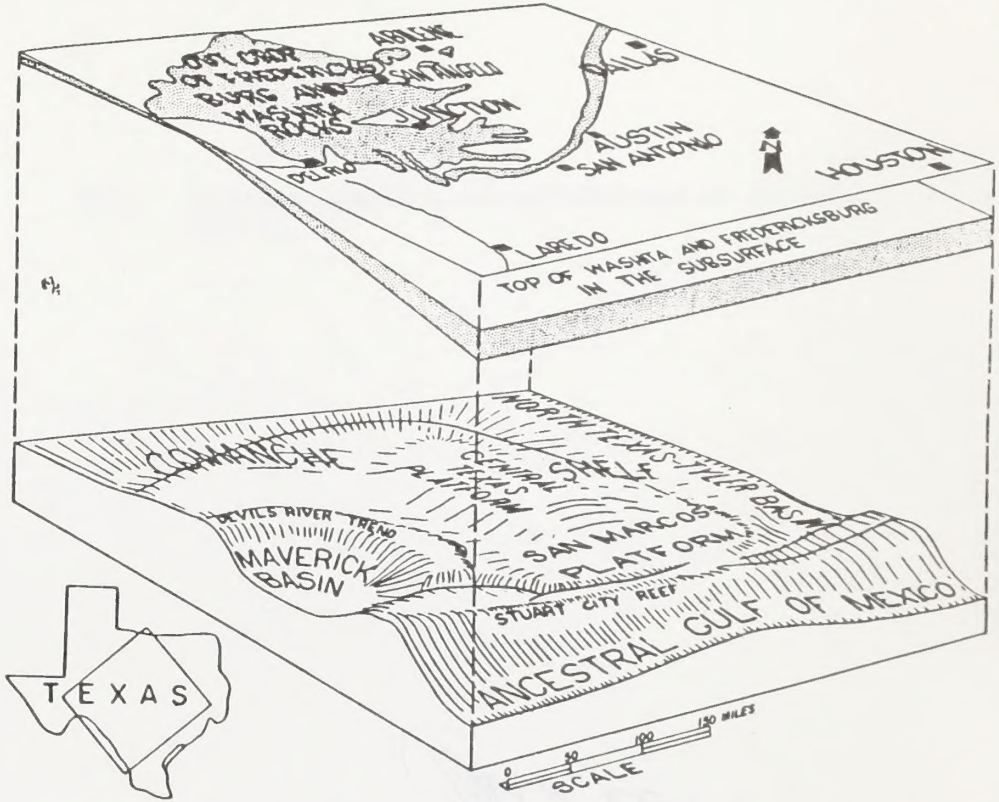


Figure 1: Regional depositional and structural features influencing deposition of the Edwards Group, in relation to Central Texas geography and surface geology (Rose, 1972).

Edwards limestone and dolomite were deposited mostly as very shallow-marine carbonate shelf sediments, on a vast, flat submarine plain called the Comanche shelf (Fig. 1). Deeper water lay to the southeast in the ancestral Gulf of Mexico basin. A long, narrow belt of skeletal carbonate sediments, the Stuart City reef (Winter, 1962), marked the gulfward edge of the Comanche shelf. Seaward of the Stuart City reef, water depth apparently increased abruptly, so that open-marine carbonate sediment accumulated in water hundreds of feet deep (Van Siclen, 1958; Winter, 1962). On the Comanche shelf, however, water was generally quite shallow, although there were broad depressions and swells in the interior of the shelf that exerted great influence on thickness and lithology of the Edwards and its counterpart formations. The two dominant depressions were the Maverick basin (Winter, 1962) on the southwest and the north Texas/Tyler basin (Fisher and Rodda, 1967) on the north and northeast. Separating these two depressions was a broad, elongate swell, the Central Texas platform, bearing southeasterly from the vicinity of San Angelo across the Llano uplift to the Stuart City reef. Most of the carbonate sediments no included in the Edwards Group accumulated in shallow-marine shelf environments on the Central Texa platform.

Figure 2 (base map) is a generalized map showing the distribution of major geologic units that crop ou in central Texas. Figure 3 shows regional thickness patterns of the Edwards Group and its counterpart formations. This map especially illustrates the wedge form of the Edwards, which thickens in a southwesterl direction from about 100 ft near Waco to about 500 ft throughout most of the Edwards Plateau and Balcones fault zone, to more than 1,000 ft in the Maverick basin where Edwards equivalents lose much of their shallow-shelf character.

Following Edwards deposition, the Central Texas platform was submerged and buried by Upper Cretaceous shales and chalks. Gulfward subsidence had already begun, so depth of burial was much greater to the southeast--up to perhaps 5,000 ft. To the northwest,

in Abbott, Patrick L. and Woodruff, C.M., Jr., eds., 1986, The Balcones Escarpment, Central Texas: Geological Society of America, p. 163-183

LETTER 66 (CONTINUED)

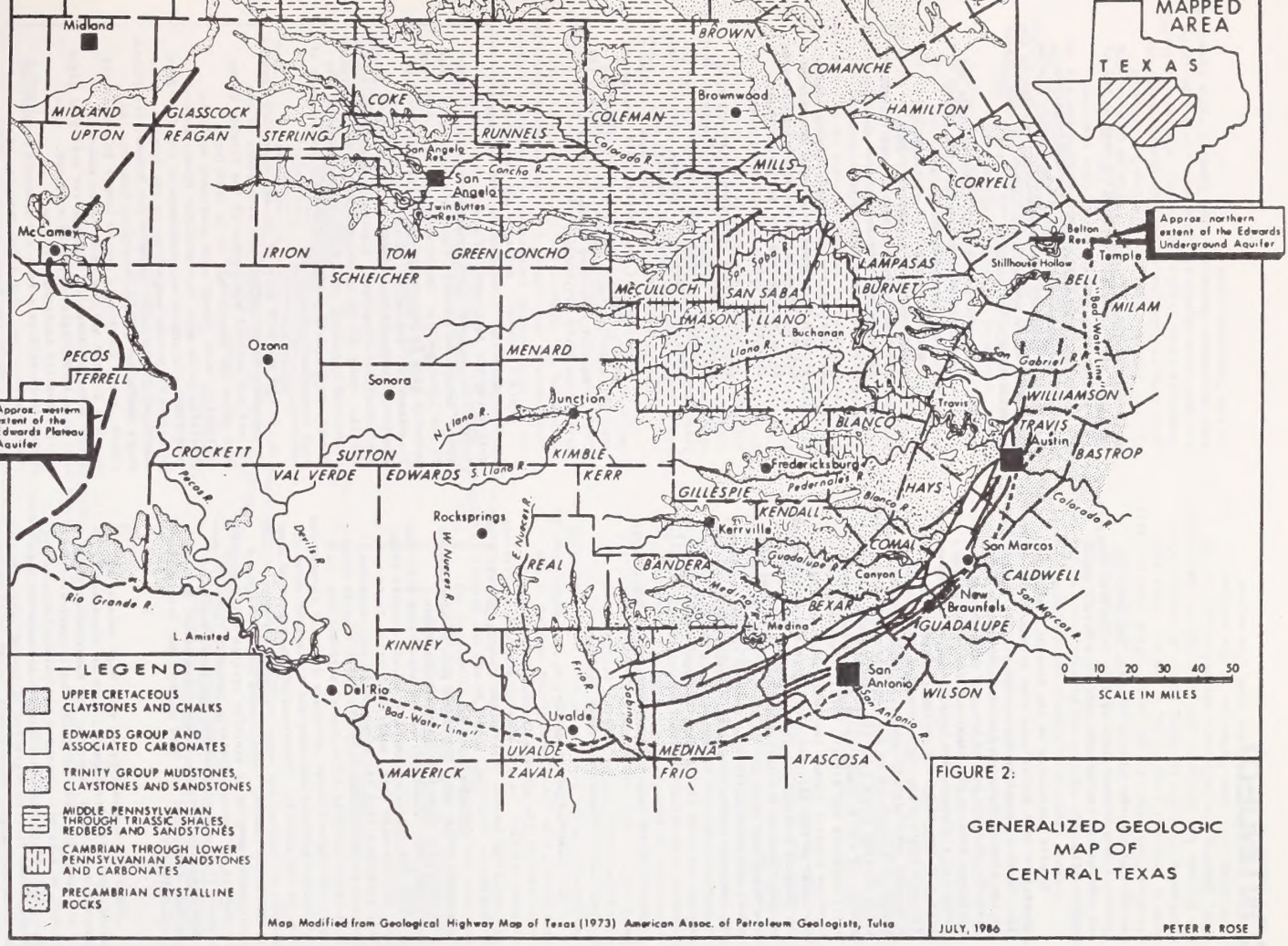
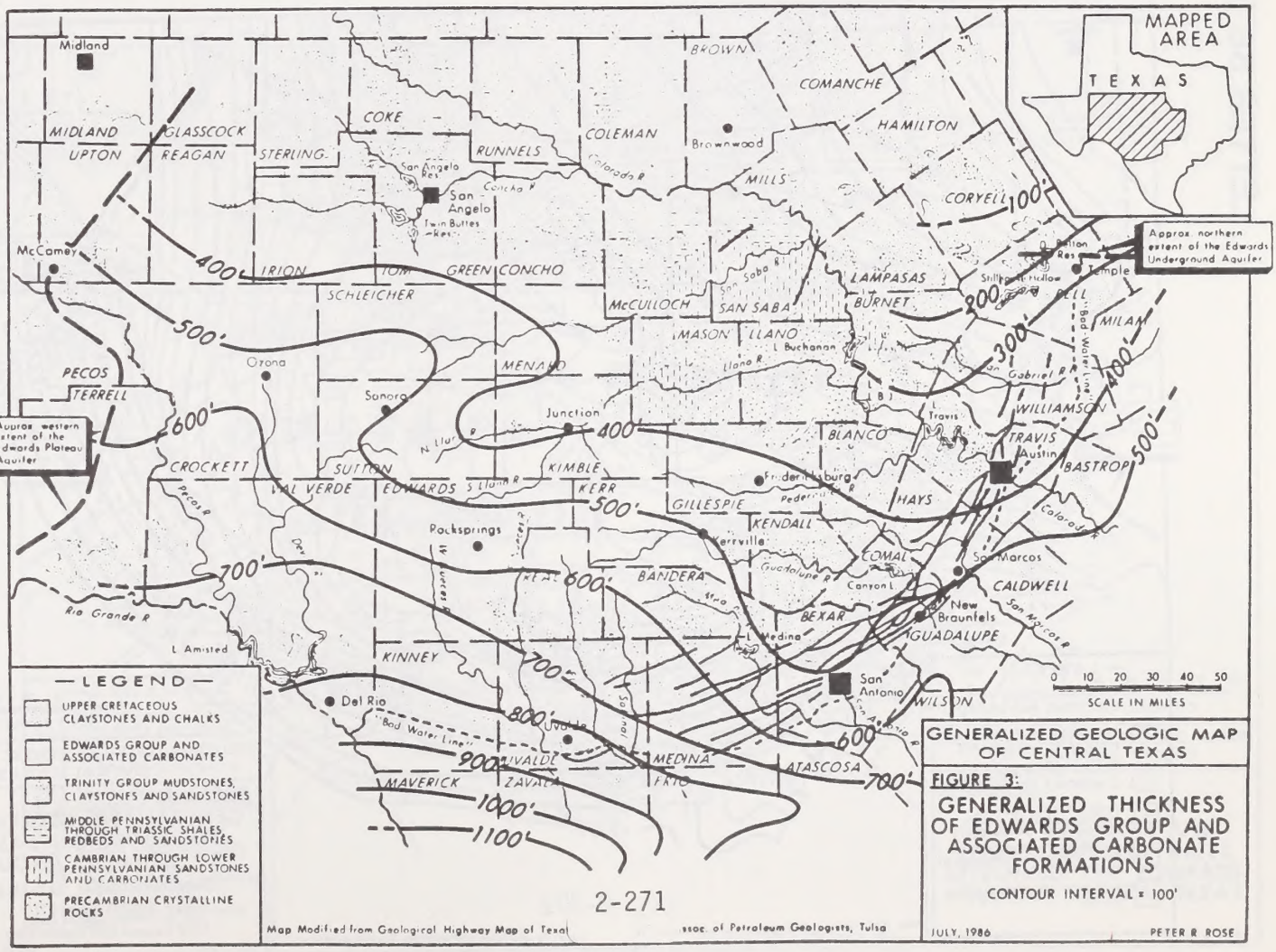


FIGURE 2:

GENERALIZED GEOLOGIC MAP OF CENTRAL TEXAS



GENERALIZED GEOLOGIC MAP OF CENTRAL TEXAS

FIGURE 3:

GENERALIZED THICKNESS OF EDWARDS GROUP AND ASSOCIATED CARBONATE FORMATIONS

CONTOUR INTERVAL = 100'

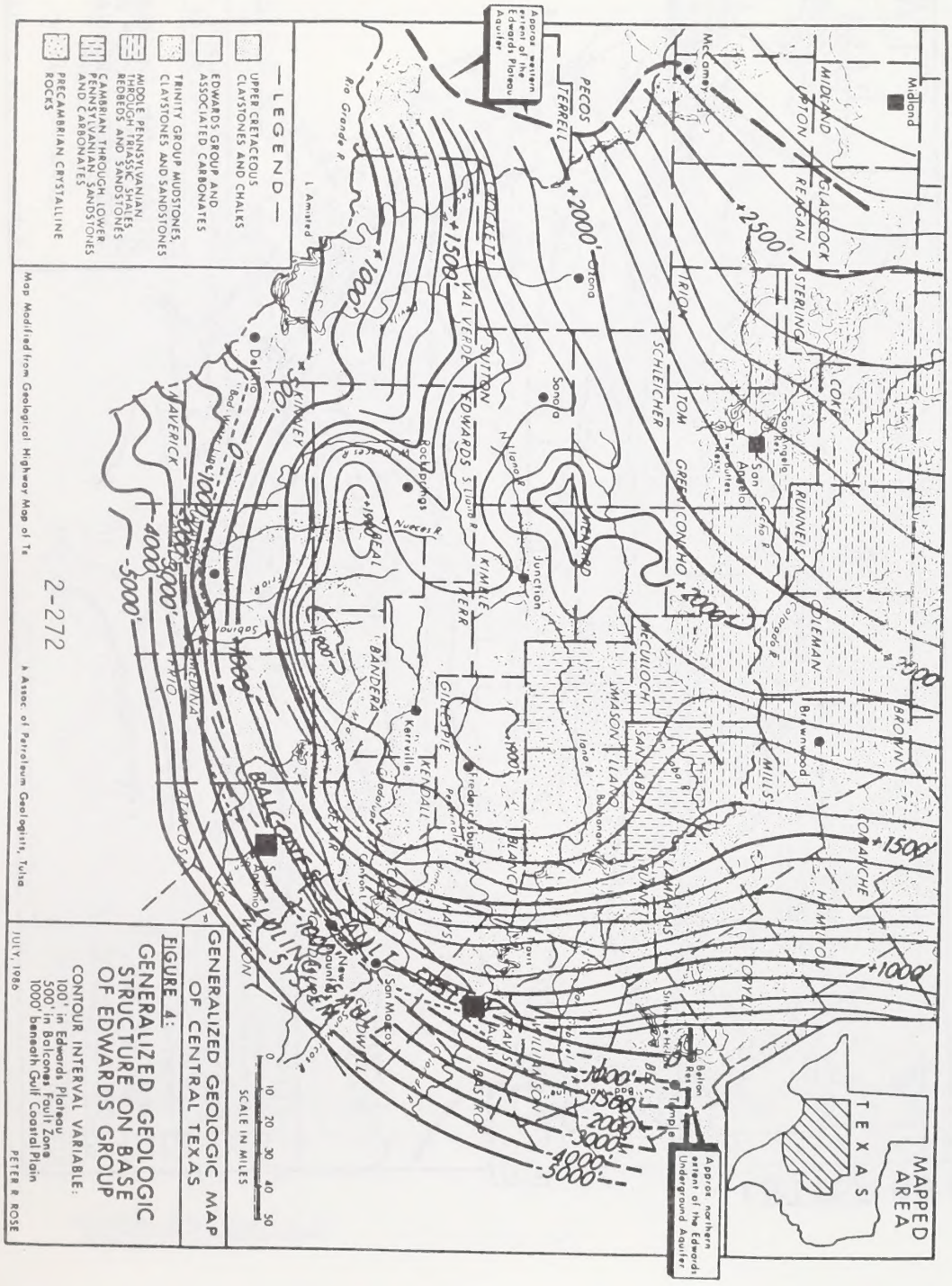


FIGURE 4: GENERALIZED GEOLOGIC STRUCTURE ON BASE OF EDWARDS GROUP

CONTOUR INTERVAL VARIABLE: 100' in Edwards Plateau; 500' in Balcones Fault Zone; 1000' beneath Gulf Coastal Plain

GENERALIZED GEOLOGIC MAP OF CENTRAL TEXAS

Map Modified from Geological Highway Map of Te... © Assoc. of Petroleum Geologists, Tulsa

JULY, 1986

PETER R. ROSE

on what is now the Edwards Plateau, and over the perennially-positive Llano uplift, structural contours on the base of the Edwards reflect a broad, domal uplift (Fig. 4).

Edwards carbonates on the Edwards Plateau may never have been buried more than perhaps 1,000-2,000 ft. Gradual emergence began during early Eocene, and by the time of Balcones faulting (Miocene), it is probable that the top of the resistant Edwards carbonate mass in the Edwards Plateau region was subaerially exposed, and karstification processes were acting on the carbonate terrane. Especially in the Balcones fault zone, such subaerial solutional processes were already enhancing early Edwards porosity, precursors to the fault-bound sluiceway that would develop later into the Edwards underground aquifer of the Balcones fault zone trend (Abbott, 1975; Woodruff and Abbott, 1979). Post-Miocene headward erosion formed the "Hill Country" region, northwest of the Balcones fault zone and southeast of the Edwards Plateau proper, by removal of Edwards divides, leaving a highly dissected terrain of Glen Rose hills and valleys. During the past 10 million years, continued uplift and erosion to the northwest, and subsidence beneath the Gulf Coastal Plain to the southeast, have produced the present geological configuration of the Edwards Plateau, "Hill Country," Balcones fault zone, and Gulf Coastal Plain (Fig. 5).

SUMMARY OF THE GEOLOGY AND HYDROLOGY OF THE EDWARDS AQUIFERS

Edwards Plateau Aquifer

The Edwards Plateau aquifer is a simple, widespread, flat-lying, unconfined aquifer in the lower part of the Edwards Group. The aquifer is present--in fact, is the sole or dominant aquifer--in all, or large parts, of 19 Texas counties (Figs. 2 and 5: Glasscock, Sterling, Coke, Pecos, and Terrell Counties are excluded based on lithologic and hydrologic criteria). The lower part of the Edwards succession is an aquifer because claystones, mudstones, and sandstones of the underlying Glen Rose, Hensell, and Antlers formations of the Trinity Group are, for the most part, aquitards, or at least much less permeable than the honeycombed and cavernous limestones and dolomites of the lower Edwards Group. As a result of this differential permeability, rain water and run-off water percolate downward through the cavernous carbonate sequence and accumulate above the base of the Edwards. Thickness of the saturated zone varies, of course, but water columns in excess of 200 ft thick are common. This ground water then moves laterally, emerging as prolific springs which form the headwaters of streams draining radially from the Edwards Plateau: the Concho, San Saba, North and South Llano, Pedernales, Blanco, Guadalupe, Medina, Sabinal, Frio, East and West Nueces, and Devils rivers (Figs. 2 and 5).

Edwards permeability is very high because of karstic porosity development, such as sinkholes, caverns, horizontal fissures, and honeycombed zones. In addition, the Edwards Plateau is crisscrossed by a network of tectonic fractures and joints (Wermund, et al., 1978) which provide effective avenues for both vertical and lateral migration of ground water through the carbonate mass. As a result, water moves downward to the top of the water table very rapidly--within hours or, at most, several days. Many area residents can describe small caves in cliff walls from which issue strong, but temporary, water-flows a day or so after summer cloudbursts occur miles away on top of the plateau.

Even though sinkholes and solution-enlarged fractures are present throughout the Edwards Plateau area, matrix porosity and permeability increase to the southeast. There are multiple causes for this lateral variation in aquifer quality:

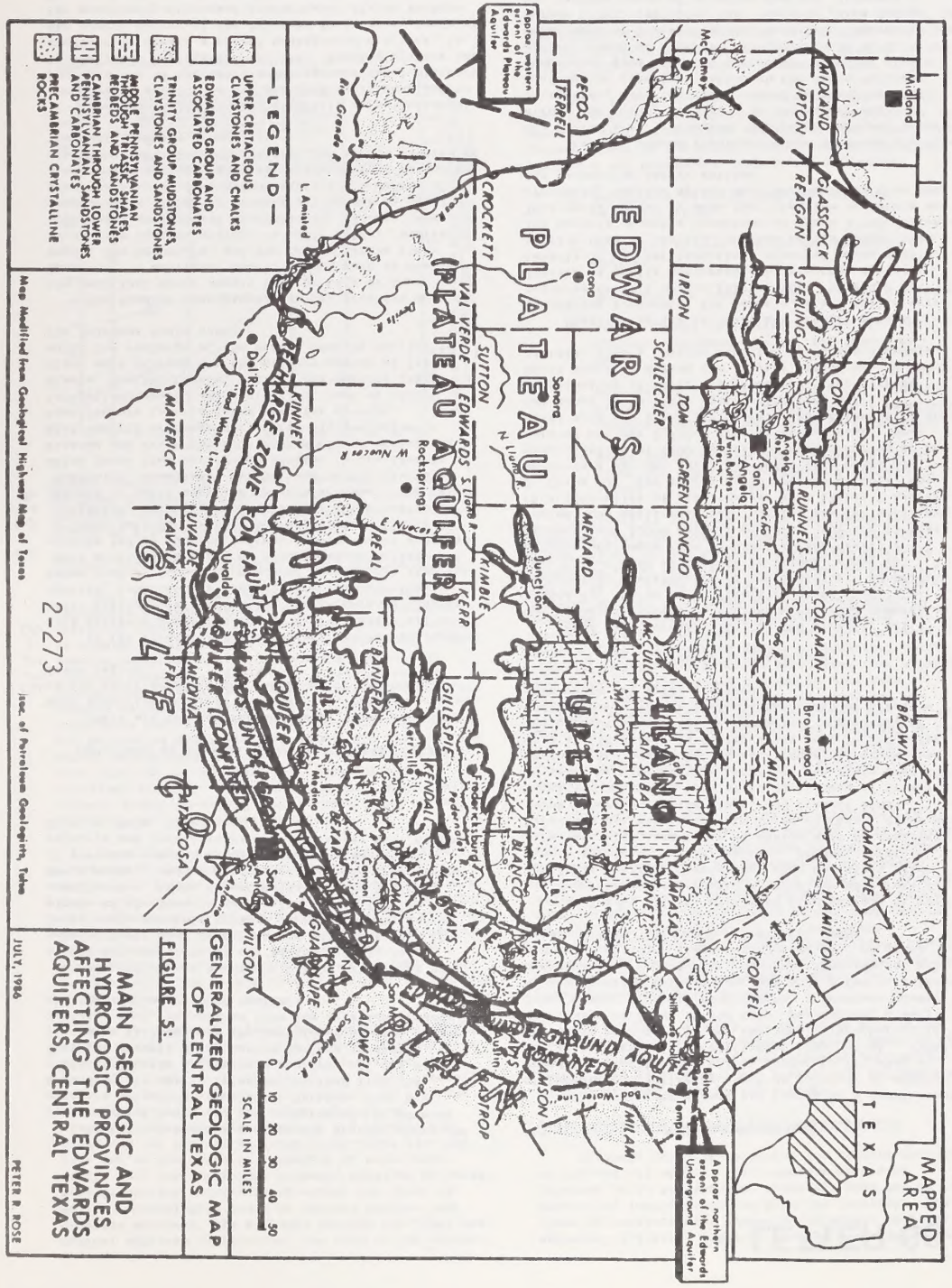
1. Evaporite solution-collapse breccias are concentrated over the interior of the Central Texas platform, where evaporitic-restricted environmental conditions were maximized. Such collapse-breccia zones are particularly prone to porosity enhancement and, thus, to cavernous permeability development.

2. For similar environmental reasons, dolomite is much more abundant in the interior of the Central Texas platform, and dolomite tends to be more porous and permeable than limestone, other factors being equal.

3. Annual rainfall increases in an easterly direction across the Edwards Plateau. There is ample evidence that ground water has acted as a "positive feedback process" that has steadily enhanced porosity and permeability in the Edwards aquifer (Abbott, 1975; Woodruff and Abbott, 1979; Maclay and Small, 1984). In other words, the more water available to move in and through the aquifer, the more enhancement of secondary porosity will occur.

Overall, however, porosity and permeability increase downward in the Edwards section, again reflecting the long-term influence of ground-water saturation, movement, and enlargement of pores and vugs. Honeycomb porosity zones are especially common in the lower part of the Edwards aquifer. Such vuggy networks seem to develop preferentially in burrowed limestones and dolomites, as well as in rudist limestones in which individual rudistids are preferentially dissolved, leaving a vuggy limestone matrix. About 200 ft above the base of the Edwards, a widespread evaporate solution-collapse horizon, the Kirschberg evaporite, also forms a horizontal zone of high transmissibility.

In the northern part of the map area, the Edwards is underlain by siltstones and sandstones of the Antlers and Hensell sandstones of the Trinity Group, with which the Edwards may be in hydrologic continuity, even though such sandstone aquifers generally yield much less prolific flows. However, impervious claystones and mudstones of the Glen Rose Formation intervene wedge-like in the Trinity, going southward and eastward, between the Hensell (or Travis Peak) Sandstone and the overlying Edwards. As a result, these sandstones are no longer in continuity with the Edwards and, in fact, these sandstone aquifers become artesian, because the overlying tight Glen Rose serves as a confining aquitard. Also, aquifer-quality sandstones in the Hensell/Antlers/Travis Peak are commonly erratic in their distribution. For these reasons, the classification by the Texas Department of Water Resources (Walker, 1979), which treats the Edwards and Trinity as one aquifer in the Edwards Plateau region, is clearly a misleading and inappropriate simplification.



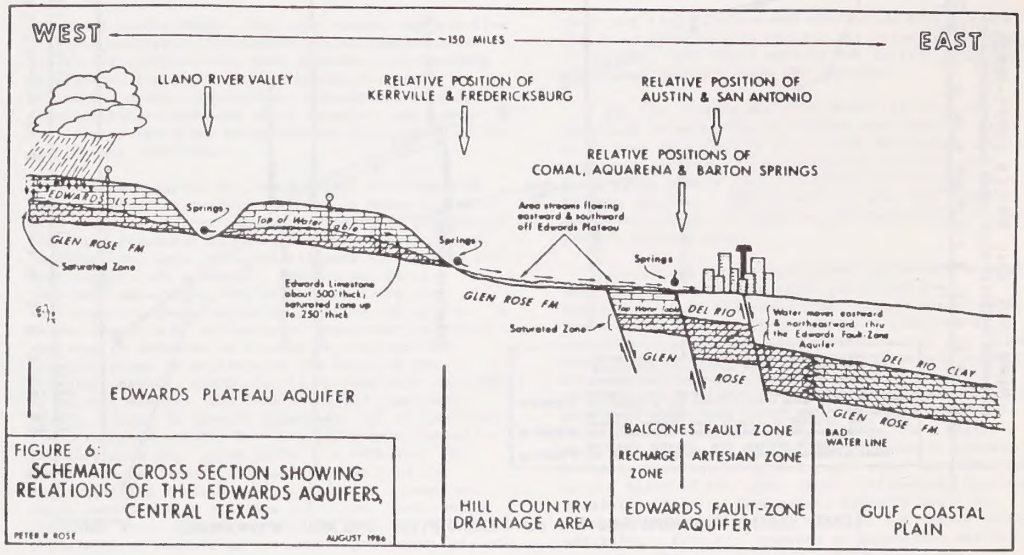


FIGURE 6: SCHEMATIC CROSS SECTION SHOWING RELATIONS OF THE EDWARDS AQUIFERS, CENTRAL TEXAS

Balcones Fault Zone Aquifer

The basic geohydrology of the Edwards aquifer in the Balcones fault zone is, by now, well understood and has been capably described by many authors, especially Arnow (1959), Abbott (1975), Maclay and Small (1984), and Senger and Kreitler (1984). The following brief review merely summarizes the conclusions of many previous workers. Because of the presence of other carbonate formations and facies, such as the thin Georgetown Limestone which overlies the Edwards, and the Devils River, Salmon Peak, McKnight, and West Nueces formations, which are lateral facies equivalents of the Edwards, hydrogeologists have adopted the useful term "Edwards and Associated Limestones" to refer to the hydrogeologic carbonate aquifer unit in the Balcones fault zone province.

In the Balcones fault zone of central Texas, Edwards and associated limestones are present in a series of linear fault blocks which trend eastward through Kinney, Uvalde, and Medina Counties and thence northeastward through Bexar, Comal, Hays, Travis, and Williamson Counties. Structure contours on the base of the Edwards (Fig. 4) indicate that vertical displacement across the several en echelon faults of the Balcones system totals about 1,000-1,500 ft in the Austin/San Antonio corridor and perhaps half that amount west of San Antonio, in Medina and Uvalde Counties.

Streams draining southward and eastward from their sources in the Edwards Plateau, such as the East and West Nueces, Frio, Sabinal, Medina, Guadalupe, and Blanco rivers cross a belt of Glen Rose outcrop, between the Edwards Plateau to the west and the Balcones fault zone to the east, called here the Hill Country drainage area (Figs. 5 and 6). This belt represents the area in which headward erosion since the Miocene has stripped resistant Edwards carbonates away, leaving the mudstones and carbonates of the underlying Glen Rose Formation at the surface. Farther east, these streams then flow across outcropping Edwards carbonates in downthrown Balcones fault blocks, and much of their water moves downward, recharging the Edwards aquifer of the fault zone. Therefore, where the Edwards crops out in the Balcones fault zone, the aquifer in the lower part is, for the most part, unconfined, analogous to the plateau aquifer.

Slightly farther eastward and southward, however, the Edwards dips underground, covered by relatively impermeable younger formations such as the Del Rio clay and Eagle Ford clays. These argillaceous formations serve as top-seals. Where they are present, the subsurface Edwards forms a confined, or artesian, aquifer. At distances of 1-20 miles downdip from the Edwards outcrops of the Balcones fault zone lies the "bad water line," a remarkable hydrologic boundary within the Edwards, marking the abrupt transition from fresh water (250-450 mg/l total dissolved solids) to sulphurous salt water (more than 1,000 mg/l total dissolved solids). Fresh ground water moves generally eastward across Kinney, Uvalde, and Medina Counties then northeastward across Bexar, Comal and southern Hays Counties within the confined "Edwards underground aquifer," and emerges at San Marcos Springs, the lowest discharge point along the fault zone. About halfway between San Marcos and Austin, in northern Hays County, may be located a vague "ground-water divide," defined by a potentiometric high (Senger and Kreitler, 1984). Water appears to flow southwestward from that divide to San Marcos Springs and northward to Barton Springs in Austin (Slade, et al., 1985). Apparently, the narrow belt of the Edwards underground aquifer has long served as a natural subsurface sluiceway, possibly even since the Miocene (Abbott, 1975; Woodruff and Abbott, 1979). Because of this long history and the "positive feedback" effects of ground-water solution on aquifer transmissibility, reservoir rocks within the Edwards underground aquifer are much more porous and permeable, with a markedly more cavernous character, than Edwards rocks downdip of the "bad water line."

Prolific permanent springs are present along the fault-bounded south and east margins of the Edwards outcrop. Discharge from Comal Springs, near New Braunfels, is mostly artesian, derived from the confined Edwards underground aquifer. At San Marcos Springs, as well as at Barton Springs in Austin, discharge is from both the unconfined Edwards of the recharge zone, as well as from the artesian Edwards of the Edwards underground aquifer.

As pointed out by Abbott (1975), the upper part of the Edwards Group in the Balcones fault zone appears to be more cavernous and permeable than the lower part, possibly because of the presence in the middle of the Edwards succession of a slightly argillaceous, tight limestone layer, the Regional Dense Member, and/or because of Cenozoic enhancement of porosity created by mid-Cretaceous subaerial exposure and karstification in the upper part of the Edwards (Rose, 1972).

IMPORTANCE OF EDWARDS AQUIFERS IN CENTRAL TEXAS

There are two Edwards aquifers. They are the most sensitive aquifers in Texas, and they are crucial to the water supplies and character of the central Texas region.

In the Edwards Plateau, upland ranches throughout this sparsely populated region derive nearly all of their agricultural water from the unconfined Edwards aquifer, commonly via windmill-powered water wells. Towns such as Ozona, Sonora, and Rocksprings also get their municipal water from Edwards water wells; streams fed by Edwards springs provide water supplies to towns such as Junction and Kerrville. Limited irrigation, primarily in cultivated river valleys, depends on water supplied by such streams. The Llano, Pedernales, Guadalupe, Medina, and Devils rivers, which issue from spring-fed streams in the Edwards Plateau and drain eastward and southward across the Hill Country drainage area (Fig. 5), are major contributors to area lakes used for storage, irrigation, power, and recreation, such as LBJ, Travis, Austin, Canyon, Medina, and Amistad lakes. Also, such streams are the primary source of fresh water for recharge of the second Edwards aquifer in the Balcones fault zone.

The Edwards underground aquifer provides most of the municipal water supply for the City of San Antonio. In addition, smaller towns such as Uvalde, Hondo, New Braunfels, and San Marcos derive their water from Edwards springs or water wells. Smaller semi-rural residential developments, ranches, and considerable irrigated farming all depend on water from the Edwards underground aquifer. A number of spectacular springs, such as Barton Springs in Austin, represent cherished recreational and scenic locales to the central Texas community.

The importance and vulnerability to pollution of the Edwards aquifer in the Balcones fault zone led to the creation of the Edwards Underground Water District by the Texas Legislature in 1959. Proceedings are now underway to create a second underground district, in the Austin sector of the Balcones fault zone, north of the previously discussed ground-water divide in Hays County. Special zoning and construction restrictions are in effect for most counties in the fault zone area, reflecting the high public awareness of the fragility of the hydrogeologic system.

PIPELINE OIL SPILLS

Like most events that are caused by a combination of independent variables, such as rainfall or mineral deposits, pipeline oil spills appear to fit what is called a "lognormal" distribution (Fox, et al., 1976). The basic attribute of any lognormal distribution is that there will be, in the total population, a very large number of small occurrences, a moderate number of intermediate occurrences, and only a few very large occurrences. A perfectly lognormal distribution will plot as a straight line on a special kind of graph paper, called "lognormal probability paper."

In Texas, all oil spills of five barrels or more are required to be reported by pipeline operators to the Texas Railroad Commission; some operators also report spills of smaller volume. Volume, location, date, recovery, and cause of spills must be reported. Pipelines are separated into three classes: crude oil trunk lines, gathering lines, and product lines. Total line-miles in each class vary somewhat from year to year, but the average total for the State from 1971 through 1985 was 75,266 miles: crude oil trunk lines were 25,738 miles; gathering lines were 26,968 miles; and product lines were 22,560 miles. Computerized spill reports do not indicate the class of pipeline from which the spill occurred.

Texas Spill Statistics

From 1971 through 1985, 15,260 pipeline oil spills were reported to the Texas Railroad Commission (Table 1). Curve A, in Figure 7, shows the probability distribution of these spills: 40 percent were larger than 49 barrels in volume, about 28 percent were more than 99 barrels, and nearly 3 percent were 1,000 barrels or more. For the 15-year period, the spill-rate (all spills) was one spill per 78.4 line-miles of pipeline per year (Table 1 and Fig. 8, Curve A). For spills of 50 barrels or more, the spill-rate was one spill per 189.1 line-miles per year. Spills of 1000 barrels or more occurred at the rate of one per 2,752.2 line-miles per year. Mean spill size was about 215 barrels and median spill size was about 36 barrels, again reflecting the lognormality of spill distributions. The largest spill reported during the 15-year period was 30,185 barrels, from a Chevron pipeline in Hudspeth County.

Pipeline spills in Texas are occurring with decreasing frequency; for example, 1,403 spills were reported in 1971 versus 751 in 1984. Although all classes of spills decreased, the greatest decrease (nearly 50 percent reduction) occurred among spills smaller than 50 barrels, whereas spills larger than 500 barrels showed a reduction of about 35-40 percent. This would appear to mean that pipeline operators are preventing smaller spills more successfully than they are preventing larger spills.

The most common reported causes of Texas pipeline oil spills are: corrosion, equipment failure, human error, and "other causes." In the latter two categories, most incidents relate to heavy equipment cutting the pipeline. Although the Texas Railroad Commission data indicate corrosion to be the single largest cause of pipeline oil spills, the U. S. Department of Transportation, Materials Transportation Bureau (1985) indicates that "outside force damage" is the leading cause of pipeline factors, followed by external corrosion and "leaks in system components other than pipe." It appears that considerable latitude exists in accounting for causes of spills. For example, a large oil spill in 1979 by Exxon in

Table 1. Statewide Data, Texas--All Pipelines

A. All Texas Pipeline Oil Spills--1971-1985:

Total spills	15,260	= 100.0%	(average per year: 1,017)
Spills greater than 49 barrels	6,211	= 40.7%	(average per year: 414)
Spills greater than 99 barrels	4,239	= 27.8%	(average per year: 282)
Spills greater than 199 barrels	2,498	= 16.4%	(average per year: 167)
Spills greater than 499 barrels	973	= 6.4%	(average per year: 65)
Spills greater than 999 barrels	434	= 2.8%	(average per year: 29)

Mean spill = 215.4 barrels
Median spill = 36.8 barrels

B. Texas Pipeline System--1971-1985:

Crude oil trunk lines	(average 1971-1985)	= 25,738 miles
Gathering lines	(average 1971-1985)	= 26,968 miles
Product lines	(average 1971-1985)	= 22,560 miles
Total	(average 1971-1985)	= 75,266 miles

C. Average Annual Spill-rates--1971-1985:

All spills: one spill per 78.4 line-miles per year.

Spills greater than 49 barrels:	one spill per	189.1 line-miles per year
Spills greater than 99 barrels:	one spill per	276.4 line-miles per year
Spills greater than 199 barrels:	one spill per	469.8 line-miles per year
Spills greater than 499 barrels:	one spill per	1,217.6 line-miles per year
Spills greater than 999 barrels:	one spill per	2,752.2 line-miles per year

FIGURE 7 CUMULATIVE PERCENT DISTRIBUTION OF OIL PIPELINE SPILLS (1971 - 1985)

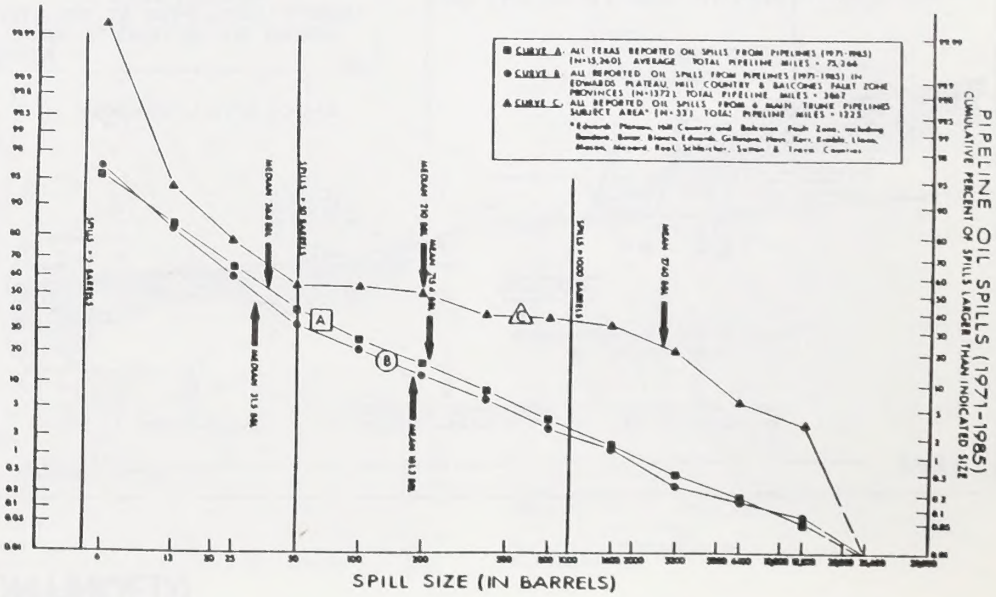
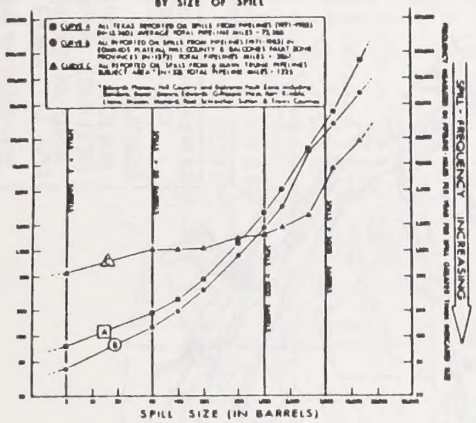


FIGURE 8: FREQUENCY OF PIPELINE OIL SPILLS (1971-1985) BY SIZE OF SPILL



Kimble County (25,224 barrels), is shown on Texas Railroad Commission computer reports as caused by corrosion--despite other evidence that the spill was caused by a longitudinal split in the 18-inch pipe.

Typical Sequence of Events in an Oil Spill Incident

Most pipeline oil spills are detected by landowners or other passers-by, by heavy equipment operators whose activity caused the pipeline rupture, by company personnel patrolling the pipeline, or by company personnel monitoring pumping stations or pipeline terminals. Some newer pipelines may be fitted with special electronic hydrocarbon-detection sensors to identify leaks. Many experienced pipeliners indicate that spills of smaller than about 0.1 percent of daily shipping volume are difficult to detect volumetrically. Most small spills of less than, say, 50 barrels, and most leaks on older pipelines are detected by manual means. Many small, chronic leaks (so-called "ghost leaks") may be very difficult to locate, once detected.

Large leaks may cause abrupt drops in pressure, which can be detected in pumping stations or terminals. Larger, more modern pipeline systems may have monitoring systems which can indicate the sector of the break, allowing rapid shutdown of the pipeline, closing of block-valves, and preferential evacuation of downstream segments to reduce outflow. Such monitoring systems may also alert cleanup and repair crews promptly and direct them to the general location of the accident.

In the event of a large leak, the entire pipeline system must be shutdown, which ordinarily requires a human decision. Pipeline transmission cannot be stopped instantly-- block-valves are closed gradually over a period of perhaps 5-15 minutes. In addition to the oil which spilled out before shutoff of transmission, a certain amount of oil between the break and the nearest upstream block-valve also may leak out of the pipeline. Spacing of such valves varies, but for the newest proposed pipeline in Texas, average spacing between block-valves was about 18 miles. Accordingly, the time between rupture and complete shutdown, the distance between the break and nearest upstream block-valve, the size of the rupture, the terrain-slope, the diameter of the pipe, the current shipping pressure, and the API gravity of the product all affect the total volume spilled.

Once a large oil spill is detected and located, operators generally respond as quickly as possible by shutting down transmission and dispatching repair and cleanup crews to the scene. Some commonly employed equipment and procedures include the following:

1. Bulldozers to build temporary earthen retaining berms.
2. Back-hoes to make ditches and gathering systems.
3. Deployment of plastic-lined catchment systems.
4. Vacuum trucks to collect spilled oil from ditches, catchment basins, and rivers or lakes.
5. Cultivators to till and retill oil-saturated ground so as to let the spilled oil evaporate, volatize, and be consumed by soil bacteria.
6. Booms and other blocking devices to collect crude oil that has spilled into streams or lakes.

Analysis of reported spills and recoveries suggests that, on average, operators recover about 40-50 percent of oil spilled in pipeline accidents involving 1,000 barrels or more, about 60 percent in spills of 100-1,000 barrels, and about 40 percent of smaller spills. This does not take into account problems in correctly measuring and reporting true sizes of spills, nor does it account for the 10-15 percent "typical" rate of simple evaporation, which renders suspect many reported recoveries that approach 100 percent of the amount claimed to have been spilled. Generally, calculated spill-volumes are probably accurate within about 10-15 percent plus or minus the actual volume spilled, and there may be room for improvement in reporting accuracy of pipeline spills and recoveries to the Texas Railroad Commission.

Depending on the location and accessibility of the accident site, it may take several hours or longer for cleanup and repair operations to begin. Many weeks of cleanup work may be required to achieve maximum possible correction. Oil spills may lead to serious fires and other human hazards. More common negative effects include killed trees; crop land or pasture land rendered barren for some years; contaminated lakes and streams; infertility, illness, or mortality of livestock and game; fish and waterfowl mortality; and ground water contaminated by hydrocarbons and heavy metals.

In fairness, however, it should be pointed out that most oil spills, especially smaller ones, do not generally cause permanent environmental destruction. Nature does eventually clear herself up, but years and much damage may ensue in the process.

Construction and Retrofitting Countermeasures

Although pipeline companies are clearly motivated to prevent oil spills, their natural corporate interest is in avoidance of crude oil loss and in the mechanical integrity of the pipeline facility. The issue of environmental damage would appear to be of secondary priority, impacted more by concerns of their corporate public image. For that reason, new pipeline projects may resist the imposition of closer-spaced block- and check-valves; more numerous, continuously maintained, repair/cleanup stations; frequent collection sumps; clay liners; concrete-lined marginal ditches; larger-diameter outer sleeves; and other design measures aimed at minimizing the effects of oil spills once they occur.

A second aspect of limitation of environmental damage during the design/construction phase has to do with pipeline routes. Obviously, there is substantial financial incentive to choose routes offering lowest construction costs, of which distance is probably the most significant. However, some routes offer intrinsic advantages over others vis-a-vis the environmental consequences of pipeline oil spills. In Texas, there is no statutory or regulatory provision applying to location of a proposed pipeline--the pipeline route is entirely in the hands of the pipeline company, which also is endowed with the right of eminent domain. The Texas Railroad Commission grants permits to operate pipelines, not to construct them, and such permits have generally been issued in the past on a pro forma basis. In addition, the Texas Railroad Commission has been assigned the responsibility to safeguard surface and subsurface water supplies from pipeline pollution, even though the Texas Water Commission clearly has the philosophical mandate and technical personnel for such regulation.

Many Texas pipelines are more than 60 years old. Given the cumulative effects of corrosion, we might expect increasing spill frequencies in these older lines. However, Texas spill-statistics would seem to indicate pipeline safety to be improving over time. The question of retrofitting of older pipelines, especially those showing an increased spill-rate, however, is an issue that must eventually be faced. This is especially true in areas of population concentration, environmental sensitivity, and fragile aquifers. Indeed, given the pace of suburban development, expanding population, and the recognition of actual historical spill-rates, the question of retrofitting may be applied even to pipelines that do not have histories of increasing spill-frequencies.

EFFECTS OF OIL SPILLS ON CARBONATE AQUIFERS

Spilled oil seeps into the ground, obeying forces of gravity and capillarity. The amount of oil that seeps downward into the bedrock depends on many variables, including:

1. The amount of oil spilled.
2. The rapidity of the spill.
3. The viscosity of the spilled oil.
4. The temperature of the ground surface.
5. The amount of vegetative and soil cover.
6. The slope of the terrain.
7. The porosity and permeability of the bedrock.
8. The moisture or water saturation of the bedrock.
9. The response time and effectiveness of cleanup crews.

Obviously, bedrock characterized by a network of very small pores, such as a fine-grained sandstone, will not accept or transmit spilled oil as rapidly as a cavernous, honeycombed limestone. Very large or extensive fractures or bedding fissures also promote rapid transmission of surface fluids downward into the bedrock. Pervasive matrix porosity can absorb a great deal of crude oil. Thin soils and sparse vegetative cover may lead to increased absorption into bedrock. Remote or inaccessible terrain may delay the arrival of cleanup crews until much of the spilled crude oil has flowed downward into the bedrock.

For the reasons outlined above, it is very difficult to determine or predict how large an oil spill must be before it will reach and contaminate a carbonate aquifer. Construction of a series of "reasonable models" led the writer to conclude that any oil spill of 1,000 barrels or more represented a reasonable danger of reaching the water table in the Edwards Plateau area.

All of the above factors make carbonate bedrock more susceptible to oil-spill pollution than sandstone. When oil seeps down through unsaturated bedrock and reaches the ground-water table in an unconfined aquifer, it then spreads out on top of the water surface. The rate of spread is highly sensitive to aquifer permeability, but tends to be rapid and extensive. For example, one barrel of standard 10W30 motor oil will form a "rainbow" covering about 200 acres of standing water. By analogy, in a highly cavernous carbonate aquifer having about 15 percent porosity, one barrel of oil could cover more than two square miles of the water table. Of course, capillary pressure acting on fine matrix porosity would be expected to absorb much of this oil and retard lateral spreading. Free oil entering an unconfined aquifer would be expected to spread and travel in the direction of water flow, emerging eventually at springs and showing up wherever wells sampled the top of the water column. One of the more insidious effects of crude oil contamination of an aquifer is the dissolution of some hydrocarbon components, such as benzene and heavy metals, which can be toxic in minor concentrations in fresh water. Moreover, the lighter hydrocarbon fractions tend to be more toxic, and they also tend to spread more readily on water.

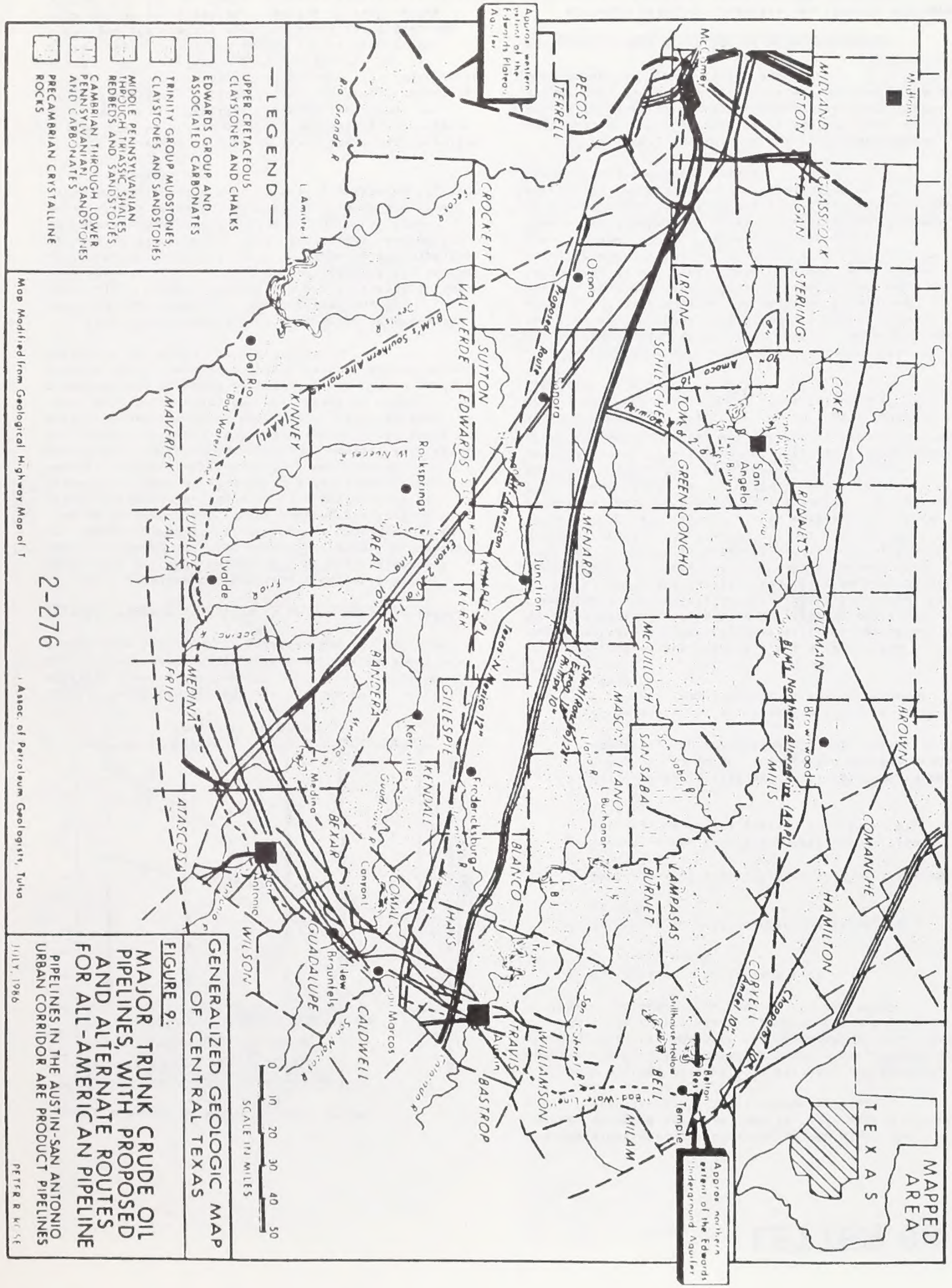
It is much more difficult to introduce spilled oil into a confined aquifer simply because, by definition, such an artesian aquifer sealed from above is "full" and under pressure, so that the buoyant oil droplets cannot enter the water column. However, soluble crude oil components can be introduced into confined aquifers.

Several methods have been suggested to recover spilled oil from aquifers, including closely spaced, intensively pumped relief wells surrounding the spill site, and the introduction of petroleum-consuming bacteria. Carbonate aquifers in which ground water is moving at rates of a few feet per day through irregular, cavernous fissures do not lend themselves to either approach. Natural biodegradation processes tend to act slowly in fresh-water aquifers. Most knowledgeable hydrogeologists agree that, for all practical purposes, once spilled oil has been introduced into a cavernous carbonate aquifer, only time and nature can take care of the cleanup job.

PIPELINE OIL SPILLS AND THE EDWARDS AQUIFERS

Spill Data in the Edwards Plateau, Hill Country, and Balcones Fault Zone Provinces (1971-1985)

Figure 9 shows the routes of many trunk, petroleum-products, and large gathering-system pipelines in the area of the Edwards aquifers and Hill Country drainage area. In the 27 counties of the subject area, there are 3,867 total line-miles of liquids pipelines (Table 2), consisting of 2,653 line-miles of trunk pipelines having diameters of 6" or larger, 224 line-miles of product pipelines of 4-8"



GENERALIZED GEOLOGIC MAP OF CENTRAL TEXAS

FIGURE 9: MAJOR TRUNK CRUDE OIL PIPELINES, WITH PROPOSED AND ALTERNATE ROUTES FOR ALL-AMERICAN PIPELINE

PIPELINES IN THE AUSTIN-SAN ANTONIO URBAN CORRIDOR ARE PRODUCT PIPELINES

JULY, 1986 PETER R. ROSE

Table 2. Summary of liquids-pipelines in counties of Edwards Plateau, Hill Country, and Balcones Fault-zone provinces, Texas

COUNTY	TRUNK PIPELINES 6" AND LARGER: MILES	PRODUCTS PIPELINES 4" - 8": MILES	LARGE-AREA GATHERING SYSTEM AND SMALL-BORE PIPELINES: MILES	TOTAL MILES
Bandera	82	0	0	82
Bexar	6	99	20 (est.)	125
Blanco	95	0	0	95
Comal	0	12	0	12
Concho	0	0	0	0
Crockett	335	0	48	383
Edwards	65	0	0	65
Gillespie	121	0	0	121
Hays	68	25	0	93
Irion	73	0	26	99
Kendall	0	0	0	0
Kerr	8	0	0	8
Kimble	163	0	0	163
Kinney	0	0	0	0
Llano	1	0	0	1
Mason	98	0	0	98
Medina	124	0	15 (est.)	139
Menard	9	0	15	24
Reagan	297	0	610 (est.)	907
Real	31	0	0	31
Schleicher	198	0	33	231
Sutton	162	0	14	176
Tom Green	18	0	4	22
Travis	84	36	0	120
Upton	615	52	205 (est.)	872
Uvalde	0	0	0	0
Val Verde	0	0	0	0
TOTALS	2,653	224	990 (est.)	3,867

NOTE: 27 counties included in area.

diameter (mostly in the San Antonio/Austin urban corridor), and approximately 990 line-miles of gathering system and small-bore pipelines (in some counties where oil production is prolific, gathering-system and small-bore pipeline mileage has been estimated).

This pipeline network experienced a total of 1,373 oil spills in the period 1971-1985 (Table 3). Spills larger than 49 barrels of oil numbered 449, and there were 32 spills of 1,000 barrels or larger. The mean spill was 181.3 barrels, and the median spill was 31.5 barrels (Fig. 7, Curve B). The system experienced one spill per 42.2 line-miles per year, considering all spills. For spills larger than 49 barrels, the spill-rate was one spill per 129.2 line-miles per year, and for 1,000-barrel (and larger) spills, the rate was one spill per 1,812.7 line-miles per year (Fig. 8, Curve B). On both Figures 7 and 8, note the close correspondence between Curve B and Curve A (which represents spill frequency for the entire State), indicating that, overall, pipeline spills in the Edwards Plateau, Hill Country, and Balcones fault zone region followed roughly the same patterns as they did for the State as a whole.

However, these data may be misleading for most of the region because there is a disproportionately high concentration of gathering lines and smaller-bore pipelines in the western counties, due to the abundance of oil fields in that area.

Accordingly, Table 4 was prepared as an attempt to focus exclusively on trunk pipeline oil spills in the subject area, since they probably represent a greater potential hazard. Only spills from the six main crude-oil trunk pipelines that cross the region were analyzed. Measurement of pipeline miles is probably more accurate, and spills can be assigned to the source pipeline without question. Twenty-two counties are included in this analysis, containing 1,225 miles of trunk pipelines. There were 33 spills in the 1971-1985 period: 18 were larger than 49 barrels, and 12 were larger than 999 barrels. The mean spill was 2,741 barrels, and the median was 210 barrels. Curve C, in Figure 7, shows dramatically the departure of the crude-oil trunk pipeline spills from populations that contain all types of pipelines: there is a much larger proportion of 1,000-barrel spills from these generally larger-bore pipelines.

Comparison with Statewide Spill Data

Figure 8 compares graphically the relationships of spill frequency by size/class among the following:

1. Statewide data, including all pipelines (Curve A).
2. Data for the subject area, including all pipelines (Curve B).
3. Data for most of the subject area, for larger-bore trunk pipelines only (Curve C).

Table 3. Data From Edwards Plateau, Hill Country, and Balcones Fault-zone Provinces, Texas, All Pipelines

A. Area Pipeline Oil Spills--1971-1985:

Total spills ..... 1,373 = 100.0%

Spills greater than 49 barrels ..... 449 = 32.7%
Spills greater than 99 barrels ..... 292 = 21.3%
Spills greater than 199 barrels ..... 166 = 12.1%
Spills greater than 499 barrels ..... 67 = 4.9%
Spills greater than 999 barrels ..... 32 = 2.3%

Mean spill = 181.3 barrels
Median spill = 31.5 barrels

B. Area Pipeline System (1985):

Crude oil trunk lines = 2,653 miles
Gathering lines (estimate) = 990 miles
Product lines = 224 miles

Total ..... = 3,867 miles

C. Average Annual Spill-rate For Period 1971-1985:

All spills: one spill per 42.2 line-miles per year

Spills greater than 49 barrels: one spill per 129.2 line-miles per year
Spills greater than 99 barrels: one spill per 198.6 line-miles per year
Spills greater than 199 barrels: one spill per 349.4 line-miles per year
Spills greater than 499 barrels: one spill per 865.7 line-miles per year
Spills greater than 999 barrels: one spill per 1,812.7 line-miles per year

Table 4. Data From Six Main Large-bore Crude Trunk Lines Crossing Area (Excludes Counties With Possible Gathering Systems and Product-lines: Crockett, Irion, Reagan, Upton, and Tom Green Counties, Texas)

A. Area Pipeline Oil Spills (1971-1985):

Total Spills ..... 33 = 100.0%

Spills greater than 49 barrels ..... 18 = 54.6%
Spills greater than 99 barrels ..... 18 = 54.6%
Spills greater than 199 barrels ..... 17 = 51.6%
Spills greater than 499 barrels ..... 13 = 39.4%
Spills greater than 999 barrels ..... 12 = 36.4%

Mean spill = 2,741 barrels
Median spill = 210 barrels

B. Area Pipeline System:

Large-bore crude oil trunk lines included:

Shell (Rancho--24") ..... 217 miles
Exxon (18") ..... 214 miles
Phillips (10") ..... 217 miles
Texas/New Mexico (12") ..... 205 miles
American Petrofina (10") ..... 170 miles
Exxon (12" or 2-10") ..... 202 miles

Total pipeline miles ..... 1,225 miles

C. Average Annual Spill Rate For Period 1971-1985:

All spills: one spill per 556.8 line-miles per year

Spills greater than 49 barrels: one spill per 1,020.8 line-miles per year
Spills greater than 99 barrels: one spill per 1,020.8 line-miles per year
Spills greater than 199 barrels: one spill per 1,080.9 line-miles per year
Spills greater than 499 barrels: one spill per 1,413.5 line-miles per year
Spills greater than 999 barrels: one spill per 1,531.3 line-miles per year

Table 5. Large Spills From Crude Oil Pipelines (01-71 thru 05-86) in Edwards Plateau, Hill Country, and Balcones Fault-zone Provinces, Texas

COUNTY	DATE	OPERATOR	PIPELINE DIAMETER IN INCHES	REPORTED VOLUME	REPORTED RECOVERY BARRELS	REPORTED CAUSE	REMARKS
Crockett	04-10-72	Texas/ New Mexico	12	1,150	120	Human error.	Blown up by gas company dynamite.
	03-31-78	American Petrofina	4	1,296	0	Defective pipe.	None.
	09-15-79	American Petrofina	6	1,719	0	Defective pipe.	None.
	11-06-81	American Petrofina	10	5,600	121	Ruptured pipe.	None.
Gillespie	03-15-77	Exxon	18	1,400	1,185	Corrosion-rust.	1/2" fitting broke off relief line.
Hays	12-14-78	Texas/ New Mexico	12	3,220	3,188	Corrosion-rust.	Reported spill-volume may be low.
Kimble	05-04-79	Exxon	18	25,224	8,730	Corrosion-rust.	Pipe split;see text.
Medina	06-03-71	Exxon	12	1,250	1,050	Pipeline split.	Reported spill-volume may be low.
	07-08-73	Exxon	12	1,300	1,200	Corrosion-rust.	Reported spill-volume may be low. Split joint due to defective pipe.
	01-08-77	American Petrofina	10	3,102	2,700	Prior damage; pressure caused split.	Cold weather congealed oil in earlier shut-down.
	01-21-77	Exxon	12	2,500	1,000	Cold weather-- line pulled apart.	None.
Reagan	08-10-72	Exxon	8,10,12 or 18	2,000	480	Corrosion-rust.	None.
	08-02-75	Exxon	8,10,12 or 18	1,000	820	Corrosion-rust.	None.
	11-18-76	*Permian Corporation	3	1,834	1,734	Corrosion-rust.	Reported spill-volume may be low.
	04-22-77	Exxon	16	10,500	10,300	Split in lining.	Reported spill-volume may be low.
	07-18-77	*Mobil	6	1,500	42	Plow hit line.	None.
	06-28-78	Exxon	26	1,085	1,040	Excess pressure.	Occurred at pump station; reported spill-volume may be low.
	12-22-78	Shell	10	1,900	20	Corrosion-rust.	None.
	01-22-79	*Mobil	4	1,000	0	Root plow hit line.	None.
	06-05-81	*Western Oil Trans.	6	1,300	900	Company truck ran over line.	Truck impact broke pump and associated fittings.
	08-30-84	*Western Oil Trans.	6-1/2	1,880	1,076	Bulldozer cut line.	None.
Sutton	09-28-71	American Petrofina	10	2,526	148	Construction crew cut line.	None.
	06-05-81	American Petrofina	10	2,500	0	Corrosion-rust.	None.
Travis	10-11-76	Exxon	18	2,761	2,100	Bulldozer hit line.	None.
	10-27-79	Exxon	18	1,100	980	Contractor laying water-line, hit with backhoe.	None.
	05-27-86	**Shell	24	2,300	2,100	Land developer bulldozer hit line with ripper.	Reported spill-volume may be low.
Upton	08-01-71	Shell	6,8,10,16 or 24	2,044	1,500	Corrosion-rust.	None.
	07-02-72	Exxon	8, 10 or 18	1,300	0	Bulldozer clearing land, hit line.	None.
	03-08-78	*Mobil	6	2,060	560	Plow hit line.	None.
	05-21-80	Exxon	18	2,309	1,320	Bulldozer hit line.	None
	05-21-80	Exxon	18	1,500	1,400	Bulldozer cut line.	Incurred while repairing line; reported spill-volume may be low.
	08-27-82	Exxon	8	2,730	130	Equipment failure.	Incorrect operations.
	09-27-85	Shell	6	1,000	900	Corrosion-rust.	Reported spill-volume may be low.

* Excluded from Tables 3 and 4.
** Excluded from Tables 3 and 4--1986 spill.

The pattern again is clear: crude oil trunk pipelines in the Edwards Plateau, Hill Country, and Balcones fault zone region incur small leaks much less frequently than do all pipelines. However, they also incur large spills more frequently than do all pipeline populations. The "crossover" occurs in the 500-1,000 barrel-spill range. For the 15 years ending in 1985, crude-oil trunk pipelines in the Edwards Plateau, Hill Country, and Balcones fault zone region incurred large spills (1,000 barrels of oil and larger) at the rate of about one spill per 1,500 miles of pipeline per year.

Interpretation

Based on the above data, we may anticipate that for the entire 27-county area, there will be about two spills per year of 1,000 barrels or larger. Excluding the five highly drilled western counties, the six main trunk pipelines crossing the pollution-vulnerable central and eastern Edwards Plateau, Hill Country, and Balcones fault zone region should experience one 1,000-barrel spill (or larger) about every 15 months.

It is also important to emphasize that when large-bore pipelines break, larger amounts of oil are spilled. Figure 7 shows that the mean spill size for the trunk pipelines was more than 10 times larger (2,741 barrels of oil) than mean spills for the other populations. Figure 8 shows that large spills occur more frequently in trunk pipelines than in other types of pipelines. Table 6 shows that the median and mean spill sizes of the smaller (10" and 12") trunk pipelines are significantly smaller than for the larger (18" and 24") trunk pipelines in the subject area.

Table 6: Comparison of median and mean spill volumes from smaller (10" and 12") versus larger (18" and 24") trunk pipelines, 22 counties of subject area.

Pipeline Diameter	Median	Mean
10" & 12" (N=24)	120 bbls.	760 bbls.
18" & 24" (N= 9)	1,100 bbls.	3,670 bbls.

It is also noteworthy that causes of pipeline spills for the large-bore trunk pipelines show a different distribution than for all-Texas pipeline spills. Table 5 gives details of all 1,000-barrel and larger oil spills in the affected area. Of the 33 total spills, 33 percent were reportedly caused by corrosion and 36 percent by external sources, such as damage by heavy equipment.

Prior and Future Studies

The question of possible oil-spill pollution of Edwards aquifers was first addressed by Fox, et al. (1976), who restricted their analysis to the area of the Edwards underground reservoir, the adjacent recharge zone in the Balcones fault zone, and the Hill Country drainage area. Fox, et al., utilized a severely limited sample--nine small spills reported from 1970 through 1975 (the largest of which was 200 barrels of oil), and 236.8 total pipeline miles. Unaccountably, they did not include in their data-set two large spills that occurred over the Edwards underground reservoir during the 1970-1976 period: the Exxon pipeline in Medina County suffered a 1,250-barrel spill on June 3, 1971 and a 1,300-barrel spill on July 8, 1973. Fox and his associates correctly noted that the spill-rate for the area of the Balcones fault zone and Hill Country drainage area was much less than the statewide spill-rate, an experience we see duplicated by comparing 15-year spill-rates for the 22-county area versus the statewide spill-rate for the same period. However, because they omitted the two large Medina County spills, they were not able to anticipate that the observed differences applied only to smaller spills having much lower potential for pollution, and that the rate for large spills in the area was similar to, or even larger than, statewide spill-rates.

Utilizing the statewide rates as an alternative, Fox and his co-workers did suggest that there was a high probability of 1,000-barrel and larger spills for time periods of several years or longer in the area of their study. In fact, there have been at least three in the 10 years since their report was published:

1. The 1978 Texas/New Mexico spill of 3,220 barrels of oil in Hays County.
2. The 1977 American Petrofina spill of 3,102 barrels of oil in Medina County.
3. The 1977 Exxon spill of 2,500 barrels of oil in Medina County.

Now that a reliable data base exists with respect to source and location of oil spills in the Edwards Plateau, Hill Country, and Balcones fault zone region, research is underway to document and assess the specific environmental consequences of the 33 large oil spills that have taken place since 1971 (Table 5).

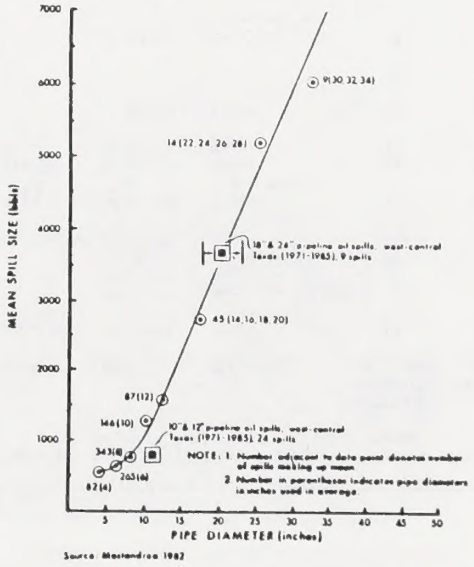
FUTURE PIPELINES - HAZARDS AND REMEDIES

Formal proposals, as well as publicized plans, involved two additional large-bore, high-pressure crude oil pipelines and the Edwards aquifers in 1985 and 1986. The All-American pipeline was planned to cross about 200 miles of the Edwards Plateau aquifer, about 70 miles of the Hill Country drainage area, and, between Austin and San Marcos, about 15 miles of the recharge and confined zones of the Edwards fault zone aquifer. Considerable public concern was expressed (as well as a flurry of lawsuits), focused primarily on protection of the Edwards aquifers from oil-spill contamination. Construction on the second pipeline, the Pacific-Texas (or "Pac-Tex") pipeline has not commenced.

The All-American pipeline is a 30"-diameter, heated crude-oil pipeline which, in August, 1986, was already essentially completed from the California coast near Santa Barbara, across Arizona, New Mexico and trans-Pecos Texas to McCamey, in Upton County. The final 450-mile segment, across Texas (Fig. 9) to refineries south of Houston, would complete the first major U.S. west-to-east oil pipeline, connecting California producing facilities to the rest of the U.S. refining/transportation network. All-American Pipeline Company is an affiliated company of Celeron Corporation, a subsidiary of Goodyear Tire and Rubber Company (All-American is presently being absorbed by Celeron). All-American spokesmen indicated the pipeline was planned to carry low-gravity (i.e., viscous) high-sulphur California heavy crude oil in the 15-20° API gravity range: hence, the need for heating and insulation to facilitate transmission. However, they also acknowledged that the pipeline might carry Alaskan North Slope crude oil, which is approximately 30° API gravity. Considering the proportional magnitude of North Slope versus California crude-oil reserves--about 7 billion barrels versus perhaps 2 billion barrels--it seems highly likely that Alaskan North Slope crude oil may well constitute a large proportion of future All-American pipeline shipments. Average transmission rates are projected to be about 300,000 barrels per day, at approximately 1,000 pounds per square inch pressure, and maximum rates would be about 450,000 barrels per day. Preliminary plans called for three pumping/heating stations within the subject area, at McCamey, near Sonora in Sutton County, and near Harper in Gillespie County. Average spacing between block-valves is assumed to be 18 miles, based upon the Santa Barbara/McCamey segment (California State Lands Commission, 1984).

Construction across Texas was halted in April, 1986, pending completion of a Supplemental Environmental Impact Statement, in which two alternative routes were also to be considered (Fig. 9): one generally north of the Edwards Plateau, the Llano Uplift, and the northernmost extent of the Edwards underground aquifer, and a second southern route across the western Edwards Plateau, crossing the Balcones fault zone just west of the westernmost extent of the Edwards underground aquifer and then turning east. Final decision on the pipeline route is scheduled for May, 1987.

The second proposed pipeline, the Pac-Tex, is a 42"-diameter heated transmission line, also designed to ship heavy crude, as well as lighter-gravity oil. Construction on this line has not yet commenced, but the proposed route is similar to the All-American pipeline. Company announcements since the All-American controversy indicate the Pac-Tex pipeline is now planned to terminate near McCamey, just as All-American first indicated, before deciding shortly thereafter to extend their pipeline on to the Houston area.



Source: Mastandrea 1982

FIGURE 10: MEAN SPILL SIZE AND PIPE DIAMETER

Projected Spill Volumes and Frequencies

As previously pointed out, oil spills from large pipelines tend to be larger than spills from small pipelines. Mastandrea (1982) presented a graph (Fig. 10) showing the relationship between pipeline diameter and mean spill size. Mean spill sizes for 10- to 12-inch and 18- to 24-inch central Texas pipelines are plotted on Mastandrea's diagram to indicate their general consistency with his results. Based on these data, it appears that mean spill size expected from a 30-inch pipeline is about 6,000 barrels of crude oil and from a 42-inch pipeline about 9,000 barrels.

An independent method by which spill volumes can be estimated is to construct a number of "reasonable scenarios," utilizing a responsible range of values for factors that control spill volumes:

1. Time between rupture and shutdown: 5, 10, 20 minutes (assume half of elapsed time is open flow; half is steadily reducing flow).
2. Shipping rates: 300,000 and 450,000 barrels per day (equals 208 and 312 barrels per minute).
3. Percent of contained oil escaping: 10, 50, 90 percent.
4. Distance between rupture and nearest upstream block-valve: 1, 9, 18 miles.

This approach enables one to gain some perspective as to possible spill-volumes under differing conditions, as well as the relative impact of different variables. It turns out that shutdown time and shipping rate are relatively insignificant, in comparison with percent of contained oil that escapes and distance from upstream block-valves, as factors influencing volumes of oil spilled in pipeline accidents.

Table 7 applies to discrete pipeline breaks, rather than chronic small leaks. It indicates that small, quickly controlled breaks would spill about 500 barrels of crude oil; intermediate spills might be expected to spill about 20,000 barrels; and very large ruptures, located many miles from block-valves, could spill more than 75,000 barrels.

The cross-sectional area of a 42-inch pipeline is nearly two times (1.92) that of a 30-inch pipeline and more than five times that of an 18-inch pipeline. Therefore, to gain a rough idea as to projected losses from a 42-inch pipeline, one can simply double the minimum, "most likely," and maximum scenario-losses excercise in Table 7.

This would indicate that the loss from an "intermediate" 42-inch pipeline spill would probably be a little over 43,000 barrels of crude oil. For perspective, it may be pointed out that, since 1971, the largest recorded pipeline oil spill in Texas, 30,185 barrels, was from a 20-inch pipeline and the second largest spill, 25,224 barrels, was from an 18-inch pipeline.

Based on the above examples, scenarios, and analogies, it appears that oil spills of a thousand barrels or larger may be expected as the rule, rather than the exception, from a 30-inch pipeline, and that it is not unrealistic to anticipate some spills of 20,000 barrels or more. Catastrophic accidents might

Table 7: Scenarios for anticipated oil spills from a 30-inch pipeline, transmitting at 300,000 barrels per day.

Scenario No. 1 (minimum case):

Elapsed time between rupture and total shutdown is 5 minutes.

90 percent of crude oil remains in pipeline.

Rupture is one mile below nearest upstream block-valve.

LOSS ..... = 540 barrels

Scenario No. 2 (intermediate case):

Elapsed time between rupture and total shutdown is 10 minutes.

50 percent of crude oil remains in pipeline. Rupture is 9 miles below nearest upstream block-valve.

LOSS ..... = 21,591 barrels

Scenario No. 3 (maximum case):

Elapsed time between rupture and total shutdown is 20 minutes.

10 percent of crude oil remains in pipeline.

Rupture is 18 miles below nearest upstream block-valve.

LOSS ..... = 77,729 barrels

spill in the neighborhood of 75,000 barrels, or more if not controlled promptly.

If each of the proposed pipelines has the same spill-rate as the six large-bore pipelines reviewed in Table 4, we should expect roughly one spill per year per 556.8 pipeline miles, or about once every two years in its route across the Edwards Plateau, Hill County, and Balcones fault-zone region. Since the median spill from 18- to 24-inch pipelines is 1,100 barrels (Table 6), the expected median spill from each of these proposed very large pipelines would be larger, probably in excess of 2,000 barrels. Accordingly, a spill of more than 2,000 barrels or larger would be expected to occur about once every four years from each pipeline. It should be reemphasized that 1,000 barrels is considered by the writer as the lower threshold of spill size which may have the potential to pollute the Edwards aquifers.

When such spill sizes and frequencies are viewed over perhaps a 50-year pipeline-life, it appears that the occurrence of one or more large oil spills polluting the Edwards aquifers is a probable, rather than improbable, event, whose environmental consequences could be severe and long-lasting.

Remedies

A number of design measures have already been suggested herein, which may serve to limit the quantity of oil spilled in a pipeline rupture. In particular, closer spaced block-valves seem to be an effective improvement. A second improvement concerns the emplacement of a continuous, electronically linked series of hydrocarbon sensors in the pipeline trench, which should greatly assist in locating chronic, or "ghost," leaks. In addition, the construction of barriers and berms to guide spilled crude oil away from especially permeable or sensitive areas along the pipeline route should be considered.

Although clay-lined trenches and large, concrete collection sumps are desirable safety features that would help in containing small, or "ghost," leaks, they do not constitute effective countermeasures against large volumes of heated oil emerging at high pressures. Also, attempts to seal off fractured areas of Edwards outcrop are not only impractical, they would also hinder the natural ground-water recharge process.

Because of the very large volumes of crude oil capable of being spilled from "mega-pipelines," it would seem essential to have continuously maintained and equipped "spill-response stations," staffed by trained personnel capable of being on the scene of pipeline breaks within about two hours of spill occurrence. In the case of the All-American pipeline, prudence would suggest the location of such a "spill station" in the Austin/San Marcos sector, because of its vulnerability and high population density, with another "spill station" located in the Sonora area.

However, all of the above remedies assume that the All-American pipeline will ultimately be built along the originally proposed central route, directly across the Edwards Plateau, Hill Country, and Balcones fault zone. The two alternative routes may offer more appropriate solutions to the problem (Fig. 9). In particular, the northern route appears to be much more attractive, for the following reasons:

1. It avoids most of the Edwards Plateau aquifer, especially the most porous and permeable areas.

2. It avoids all of the especially sensitive Edwards aquifer in the Balcones fault zone in the Austin/San Marcos urban corridor.

3. Along the northern route, from the vicinity of San Angelo to central Mills County, there are no significant or widespread aquifers, and population density is low. In addition, dominantly clayey surface formations there would significantly restrict percolation of spilled crude oil into the subsurface.

4. From central Mills County across Coryell County, the pipeline would cross the Trinity Sand aquifer. This aquifer is much less susceptible to oil pollution than the Edwards aquifers, by virture of its lower permeability and greater amenability to spill-recovery methods. Also, fewer people rely on the Trinity as a water source.

CONCLUSIONS AND RECOMMENDATIONS

1. There are two "Edwards aquifers" in Texas, one in the Edwards Plateau and the second in the Balcones fault zone area. Both are fractured, cavernous aquifers developed in carbonate rocks that were deposited in very shallow-marine shelf environments. More than a million people in central Texas depend on these aquifers for drinking, agricultural, and recreational water.

2. Because of their exceptional permeability, and the general lack of soil or vegetative cover, the Edwards aquifers are unusually vulnerable to pollution from oil spills. The basic problem is that spilled crude oil flows downward into the bedrock before cleanup crews have time to recover it. Thereafter, such crude oil can move downward to the top of the water table, where it cannot be recovered by mechanical or chemical means.

3. It is estimated that any oil spill of 1,000 barrels or larger probably has a reasonable possibility of reaching the water table in either unconfined Edwards aquifer. Spills of 5,000 barrels, or more, can probably be expected to contaminate Edwards ground water to some degree.

4. Analysis of more than 15,000 spills from Texas oil pipelines, since 1971, provides a reliable basis for assessing frequency and volume of pipeline oil spills. About three percent are spills of 1,000 barrels or larger. The most common cause of large spills is outside-force damage, not corrosion. Human errors and failure of mechanical components are also common causes.

5. In large pipeline accidents, Texas operators generally recover about 40 to 50 percent of the crude oil that was spilled.

6. Expectable environmental damage from crude oil spills includes killed trees; barren agricultural land; contaminated lakes and streams; infertility, illness, or mortality of livestock and wildlife; and contamination of ground water by soluble and insoluble hydrocarbons and heavy metals. Many of these components are highly toxic. Duration of contamination of fresh-water aquifers is expected to be on the scale of years, rather than days.

7. Routes for any newly proposed large-bore trunk pipeline should require approval by the Texas Water Commission, in order to protect sensitive aquifers and surface streams.

8. In the future, selective retrofitting of six existing trunk pipelines in the Edwards Plateau, Hill Country, and Balcones fault zone region is likely to become more desirable in light of the following:

   a. Advancing age.
   b. Increasing population.
   c. Recognition of especially vulnerable zones of the Edwards aquifers.

9. Within the Edwards Plateau, Hill Country, and Balcones fault zone region (excluding the five western oil-producing counties of Upton, Reagan, Crockett, Irion, and Tom Green, where spills will be more frequent), we may anticipate an oil spill from one of these six trunk pipelines about every five to six months: a spill of 1,000 barrels or larger can be expected to occur about every 15 months.

10. Previous studies (Fox, et al., 1976) correctly perceived the lower frequency of all oil spills affecting the Edwards aquifer in the Balcones fault zone and Hill Country drainage area relative to statewide spill-rates, but did not detect that the frequency of large spills was higher than the statewide average, not lower.

11. Based on historical pipeline performance, crude oil spills from a 30-inch pipeline constructed across the Edwards Plateau, Hill Country, and Balcones fault zone can be expected to occur about every two years. About half will probably be greater than 2,000 barrels, and the average spill will be about 6,000 barrels, which is considered to be a polluting spill. Several large oil spills in excess of 20,000 barrels may be expected, and the size of a major oil spill could reach 75,000 barrels or more.

12. Suggested design modifications to reduce spill volumes include closer spaced block-valves; centralized shutdown systems for older lines; electronically linked hydrocarbon sensors; and the construction of barriers to guide spilled crude oil away from sensitive areas. Other measures may be useful in controlling small chronic leaks, but will be ineffective against the heat and pressure of major spills.

13. One or more continuously staffed and equipped "spill-response stations," located near especially vulnerable areas of the pipeline route, can significantly increase the amounts of oil recovered from spills.

14. The suggested northern alternate route appears to represent significantly less hazard to ground water than does the central route across the Edwards Plateau, Hill Country, and Balcones fault zone, proposed originally by the All-American Pipeline Company.

ACKNOWLEDGEMENTS

The writer acknowledges the support of the Travis County, Texas, Attorney's Office and the Environmental Division of the Texas Attorney General's Office. Special appreciation goes to Ms. Barbara Wiley, who drafted the illustrations, and to Ms. Karen L. Rose and Ms. Robin I. Heap for their care in typing and editing the manuscript.

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LETTER 67

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March 4, 1987

Mr. William Haigh, Project Manager
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Subject: Transmittal of Comments

Gentlemen:

Transmitted with this letter are my comments on the Draft Supplemental Environmental Impact Statement for the extension of the All American Pipeline in Texas, and my comments on the Pipeline Leak Detection Study prepared by John Mastandrea and which has been used for the basis of some parts of the SEIS.

Very truly yours,

George K. Hickox

George K. Hickox, P.E.

RESPONSE TO LETTER 67

LETTER 67

COMMENTS OF GEORGE K. HICKOX ON THE REPORT
PETROLEUM PIPELINE LEAK DETECTION STUDY

By

JOHN R. MASTANDREA

Prepared for

THE BUREAU OF LAND MANAGEMENT

In Conjunction With The All American Pipeline SEIS

67-1 The subject report is considered to be an excellent compilation of data concerning the extent of the petroleum pipeline network in the U.S.A. and the history of pipeline failures and their causes in this pipeline network. It is also considered an excellent attempt to define methods and means for detecting potential failures, preventing such failures, and limiting the damage caused by future failures. This latter effort uses all types of general data, applied in a general way, to the entire industry, and is lacking in several important areas when one considers using the information on a specific pipeline. With all due respect to the author, the report says this same thing in its recommendations where it states that, "Since there are many variations between lines and wide ranges in the oil spill risk, it is beyond the scope of this study to recommend programs for particular lines." It goes on to state that, "..sufficient information is provided so that a user may develop a program for his own line." My own opinion is that a program for a particular line based on the the information in this report would be essentially ineffective. There are some practical considerations from both a technical and a commercial standpoint that I feel support my position.

67-2 The report treats the problem from a nationwide point of view, lumping all pipelines together, segregating out groups of lines by age, diameter, and location, addressing total number of spills, leaks, ruptures and total volumes of oil spilled, etc. All of the information is interesting and informative, but applying much of it to a specific pipeline, particularly a new line now being constructed, is an exercise in futility.

67-3 It is my opinion, having worked on pipeline design and construction projects in many locations for many years, that properly engineered and constructed pipelines already have quality assurance programs that address the possibilities of leaks, spills and ruptures and how to prevent them

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67-1 The use of the Mastandrea report for the Draft SEIS provided a mechanism by which to estimate the probability of a pipeline failure or rupture which could possibly result in an oil leak. These data were then used by discipline specialists to evaluate the relative risk of spilled oil to various environmental and other resources along the proposed pipeline route and the alternatives. The procedures presented in the Mastandrea report represent the current state of knowledge in making such assessments. One must start with the historical failure statistics and determine the type of pipeline they represent. This is then defined as the reference pipline. Adjustments, or correction factors, are then applied to the line in question to account for design differences or differences in operational practices which distinguish it from the reference line. Please refer to the Modifications and Corrections section for page 4-10 which explains the purpose of making the spill frequency estimates.

The calculated spill rate for the All American Pipeline was not used to justify the suitability of the design or operating practices as stated by the comment. The design suitability was carried out by comparing the preliminary design information presented in the Draft SEIS to applicable codes, standards, and regulations. Mitigation measures were recommended where design and/or operating deficiencies were noted. In addition, since the design information is preliminary, Mitigation Measure SS-3 in Appendix A was developed to require a review and approval of the final engineering design, and require corrections to be made if not in compliance with codes and standards. The review will also ensure specifications are included for the mitigation measures required by the BLM in its record of decision.

67-2 Please refer to the response to Comment 67-1.

67-3 Please refer to the response to Comment 67-1.

67-3 Cont. and handle them if they should occur. It is felt that application of historical statistics and arbitrary calculations to such programs is of no value whatsoever. This is not to say that good engineering and planning is not needed, but it is hard to believe that any value is obtained by being able to do some mathematical calculations to show that "x" number of leaks most probably will occur over a period of "y" years and that "z" volume of oil will be spilled. A properly engineered program will have

67-4 taken into consideration the well known data with regard to the causes of failures and will provide for contingency plans to deal with a small leak or a disastrous rupture at any time and at any place along the pipeline.

67-5 Statutory rules and good practice require that special precautions be taken for special areas, and again, properly engineered pipelines cover these matters without having to resort to statistical probabilities. The use of a program suggested in the report to define the risks and results of failures is grossly unfair to pipeline companies that did a superior job of engineering, planning, and construction management. It is far too dangerous to all concerned to apply such an approach by pipeline companies that have done an inferior job of engineering, planning, and construction management. The only companies that it would apply to correctly are those that fit into the model pipeline used as the base case or standard. There is sufficient information available to any serious investigators to show that the All American Pipeline falls into the category of a pipeline that was not and is not adequately engineered and planned for the proposed location and type of service.

67-6 One technical subject of importance is not discussed at all as far as I can discern, and another technical area is discussed in an inappropriate manner. Nowhere do I find any discussion of fatigue as a contributing factor for failures. This is probably due to the lack of information within the industry about specific failures caused by or affected by fatigue. Oil pipelines, more than natural gas pipelines, can anticipate an operating lifetime of many cycles of fluctuating internal pressure. There are several reasons why oil pipeline pressure fluctuates, and there are known methods of predicting cyclic stress levels and cyclic count. In many pipelines the number of cycles encountered or expected to be encountered at significant stress levels would not be of serious concern. For other lines, those that go through thermal, seismic, and subsidence cycles

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67-4 Please refer to the Oil Spill Contingency Plan outline in Appendix B of the Draft SEIS and Modifications and Corrections pages B-1 through B-66.

67-5 One of the results of the Mastandrea procedure is that pipeline companies who do have superior design and operational practices are recognized by lower estimates of spill rates than pipeline companies which just meet minimum standards.

67-6 The age correction factor used in the spill rate estimates account for the fatigue factors described by the comment. The preparers cannot state with confidence the frequency at which fatigue is a factor in pipeline ruptures because fatigue is not an explicit cause factor as described in the DOT data base on pipeline spills.

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67-6 Cont. as well as pressure cycles from normal operations and hydrostatic testing, the number and stress level of the fluctuations could be very important.

67-7 With regard to hydrostatic testing as a means of checking pipeline integrity, the report does not mention that there is strong evidence that such hydrostatic testing after a pipeline is installed can be more harmful than beneficial. Work done by Battelle Memorial Institute and reported at the Fifth Line Pipe Research Symposium, November 22 - 24, 1974, in Houston, Texas, and later published in The Oil and Gas Journal, January 13, 1975, presents evidence of this with full technical justification. This work was not referenced in the References section of the report.

67-8 A great amount of the report is related to methods of inspection and monitoring of operating pipelines in order to assess factors related to the potential for preventing and discovering leaks/spills, and for limiting the amount of product spilled in case of an accident. Much of this I find to be not practical. The first impression I get from analyzing this subject matter is that the report was prepared by people not directly involved with designing and building pipelines. The use of some of of the suggested methods, admittedly still in the developmental stage, are considered to be impractical and/or ineffective. Mathematical modeling is considered nothing more than churning the statistics until some numbers come out predicting the "x", "y", and "z" mentioned earlier. Such efforts might allow owners and operators to sleep better, but there is quite some doubt that it can prevent, predict, or minimize a leak/spill in a specific pipeline. The cost and technical perfection of the Passive Acoustic Array system and the External Rods with Passive Acoustic Sensors system will take years to analyze before they could prove to add to pipeline safety.

67-9 The subject of Inspection by Magnetic Flux type or other comparable internal line-travel pigs is given some important consideration. What is not stated is that there are two opposing positions in the pipeline industry with regard to such devices. One side claims that the use of such pigs, although not perfect, is a viable and acceptable way of getting important information about the status of the line with regard to existing corrosion and potential trouble areas. The other side of the story is that such inspections are very prone to errors in depicting the location and extent of corrosion, and that the information obtained is of little use. The opponents claim that the inspection itself is expensive, but not

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RESPONSE TO LETTER 67

67-7 Hydrostatic testing is a requirement of the DOT regulations in 49 CFR Part 195. The BLM is not at liberty to waive this requirement.

67-8 The use of passive acoustic array and similar systems were not included in AAPL's proposed system design or recommended by the BLM as mitigation.

67-9 The use of magnetic flux type inspection pigs was not included in AAPL's proposed system design or recommended by the BLM as mitigation.

67-9 Cont. nearly as expensive as trying to reliably find and repair those areas of the line indicated by the inspection company as being faulty. It is my opinion that the inspection companies guarantee almost nothing other than that they will send the pig through the line and present hard-to-interpret logs of the condition of the pipe. Improvements in these systems over the past few years may have eliminated some of the critics from previous times, including myself, since it has been several years since I have had any direct experience with such inspection systems.

67-10 It is my personal opinion that All American Pipeline Company cannot prepare a program covering the risks involved and predictions of pipeline failures, using the methods outlined in this report, and have anything more than a book of useless calculations. One of my own beliefs is that most of the potential danger of leaks/spills in the proposed pipeline has already been irretrievably built into the pipeline. The quality of the pipe, the type of anti-corrosion coating, and evidence from what has already taken place on the sections of the line that have already been constructed are some of the things that are already established. One cannot go back and correct errors and omissions in the engineering, or get the pipe made to a higher quality, or change the coating, or manage the construction better for those parts of the line already constructed. For the proposed extension the construction management could be done to a higher degree of professional excellence, but most of the other items are

67-11 already established. With regard to spill contingency plans, AAPL can and should come up with such plans that are considered as good as or better than the industry standards for the extension portion of the line.

Prepared March 4, 1987

George K. Hickox

George K. Hickox, P.E.

RESPONSE TO LETTER 67

67-10 Please refer to Comment 67-1 regarding the relevance of the Mastandrea study to the SEIS effort. Quality assurance of the pipe and related materials is covered on page 2-12 of the Draft SEIS. No additional data on quality assurance of materials was provided by AAPL.

67-11 The Oil Spill Contingency Plan is provided as Appendix B of the Draft SEIS. Based on review comments, Modifications and Corrections can be found on pages B-1 through B-66.

LETTER 67

COMMENTS OF GEORGE K. HICKOX ON
THE DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE PROPOSED ALL AMERICAN PIPELINE PROJECT

Prepared for
THE BUREAU OF LAND MANAGEMENT

The draft SEIS for the All American Pipeline extension from McCamey, Texas to the Gulf Coast area dated January, 1987, has been reviewed. Following are my comments with regard to this document. They are, in some places, related to the review of many other project documents reviewed over the past year in conjunction with this project and a special report on Pipeline Leak Detection Study prepared by John R. Mastandrea. The opinions expressed are based on my experience in the field of pipeline engineering and construction management over the past 23 years.

Perhaps an Environmental Impact Statement normally confines itself to the effects of a given event or an unexpected event on the various parts of the environment. That is my first impression of the AAPL SEIS. I find it hard to accept in those terms. Would the preparers of an EIS for a nuclear power plant be unconcerned about the design and quality of construction of the plant and only interested in what happens during construction and later with regard to damage to the environment? I would think not, but this may be the case. In such a case, other regulatory bodies would and should have concerns about adequacy of design and construction quality.

67-12 In the case of AAPL, the SEIS has almost nothing to say about the actual quality of the pipeline design or proposed construction program. My comments at the Scoping meeting in Del Rio, and my comments herein are directed mostly at those aspects of the project. It seems to be the position of the preparers of the SEIS that AAPL has complied with the required and normal practices governing the design of the pipeline and that AAPL will comply with all required and normal industry practices during construction of the extension in Texas. There is hard evidence that the design is not up to normal industry standards (although it may meet the letter of the law with regard to minimum Federal standards), and there is evidence that prior construction practices on this project are

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RESPONSE TO LETTER 67

67-12 Please refer to the response to Comment 67-10 regarding quality assurance. Mitigation Measure SS-3 in Appendix A has been provided to ensure the final pipeline design, construction, and operating practices comply with applicable codes, standards, etc.

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67-12 Cont. also below the normal industry standards. If the preparers of the SEIS are not concerned with these matters, then who is? Does the Office of Pipeline Safety of the Department of Transportation have any responsibilities or jurisdiction in this project? The basic question is,"Who reviewed the Project Design Manual and the Project Quality Assurance Manual, or the appropriate documents if these documents are not available, in conjunction with the preparation of the SEIS?" In the list of preparers I can find only one person who was charged with reviewing the project description, and it would be interesting to find out about his and/or other preparers' experience in the pipeline industry.

67-13

Since one of the main underlying reasons requiring the preparation of the SEIS was the fact that the proposed pipeline was to cross very, very sensitive areas, it is not understood why someone did not take a critical look at (audit) the design and the actual performance of the work already done on other parts of the project. If the areas to be crossed are, indeed, more environmentally sensitive than other areas traversed by the pipeline, then application of minimum standards may not be sufficient. Unless someone does a critical review of the design and previously completed work, there is no way of assessing the expected quality of the proposed extension. I feel this is a basic oversight by someone, and if the preparers of the SEIS do not have jurisdiction over these matters then someone should determine who does have the jurisdiction and that party should take appropriate action.

67-14

Someone might question why I feel an audit of the design and prior construction is important. My review of project documents, from the very first of my activities, raised serious questions about the commercial viability of the pipeline, and the more I reviewed, the more convinced I became that there were flaws in the original concept and original implementation of the project. If my suspicions that the project was ill-conceived and improperly managed at the early stages, then it is only logical that questions about the quality of the continuing work and the integrity of the pipeline would be raised. I did raise questions about the quality of the work and the integrity of the line at the Scoping meeting. None of my concerns are addressed in the SEIS, as far as I can tell.

67-15

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George K. Hickox, P.E.

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67-13 SEIS preparers are very knowlegable about pipelines in general and crude oil pipelines in particular and included several Registered Professional Engineers with 20 to 30 years experience in the pipeline industry. The BLM was involved with the inspection and enforcement of activities being conducted by AAPL on the California to McCamey segment and have observed first-hand the construction practices being used. As an interstate pipeline, DOT does have legal jurisdiction over the All American Pipeline under 49 CFR Part 195. Please refer to Comment 6-15 concerning compliance with regulations.

67-14 Minimum design standards were not applied to environmentally sensitive areas of the pipeline route. Please refer to the Applicant's proposed design features for the Edwards Aquifer recharge zone on pages 2-27 through 2-30 of the Draft SEIS and the various System Safety Mitigation Measures in Appendix A.

67-15 Mitigation Measure SS-3 in Appendix A provides for the review requested by the comment.

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67-16 The History and Background section of the SEIS conveniently omits some interesting information that is readily available. It does not give a history of ownership of AAPL, and I believe that this is significant. The pipeline was originally conceived and planned by individuals, not by Celeron or Goodyear Tire & Rubber Company. The individuals sold their interests to Celeron in March, 1983, and Goodyear merged with Celeron in June, 1983. By this time, all of the basic conceptual work on the design had been done, and continuing work was done under the direction of the same individuals that conceived the project. The fact that two large corporations purchased the project does not alter the evidence that suggests that the project was not properly initiated. Some interesting aspects of the history of this project and oil pipelines in general are:

67-17
- As of January, 1986, when the President of AAPL testified in open hearings, the project had no commitments from shippers to ship any oil whatsoever. It is virtually unheard of that someone would build a major oil pipeline without having firm, long-term commitments from shippers before starting construction. How anyone could properly evaluate the commercial viability of the line without having commitments is not understood. It is entirely possible that the project still has no commitments other than what the owners can guarantee.

67-18
- The economics of such a project usually are critically affected by the time it takes to complete the line and start operations after the financing has been arranged and committed. Normal construction time for a project of this size and length would be no more than two years. AAPL has stated publically that the delays on the Texas portion of the line do not seriously affect the project plans. It appears that under the most favorable of all possibilities the line will not transport oil within a period of three years or more after starting construction. Either normal pipeline economics are wrong when applied to AAPL, or AAPL has made some serious management errors. If there have been these suggested errors, the solution to the problems might well result in trying to save money at the cost of reduced quality.

67-19
- AAPL is only one of four recently proposed west to east oil pipelines in the Western U.S.A. The others are: 1. Northern Tier

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67-16 Please refer to the Mitigation Measure SS-3 in Appendix A. Its primary purpose is to allow the BLM to assist DOT in evaluation of design specifications, and to ensure proper project construction and operation.

67-17 For discussion of the supply and demand and the overall need for this project, please refer to the response to Comment 56-1.

67-18 Mitigation Measure SS-3 enables the BLM to review construction and operation design specifications, and to ensure the mitigation measures are included in the design and construction. BLM served in this role west of McCamey on Federal lands.

67-19 Your comment regarding the construction of the All American Pipeline without shipper contracts in hand is noted.

67-19 Cont.

Pipeline, a proposed line from the Seattle, Washington area to the Midwest refining areas. This project encountered serious objections from parties concerned with the environment and general safety, and the project was abandoned after final analysis of the costs and time to satisfy all concerned parties showed the project to be too commercially risky for the owners to proceed. 2. Standard Oil of Ohio worked for four years or more trying to prove the technical and commercial viability of a proposed crude oil line from the Long Beach, California, vicinity to Texas. This project was abandoned primarily for the lack of being able to economically obtain all of the permits required to proceed. 3. Pacific-Texas Pipeline is a project currently being planned to follow essentially the same route as the previously mentioned SOHIO project. It is still in the planning stage with expectations of going into construction in late 1987 or during 1988. It is noteworthy that none of these three projects committed any funds to procurement or construction activities. Two of the projects obviously followed good industry practice of evaluating the project and abandoning all efforts when they realized the true situation. AAPL appears to have disregarded the same type of analysis and opted to continue in the face of the negative aspects.

67-20

- Major oil pipelines, whether in the U.S.A. or elsewhere, are normally owned and operated by companies or groups of companies that own the oil that will be transported, or own the refining facilities that will use the oil, or both. Along these same lines of thinking, companies that would commit large amounts of oil for transport through a pipeline for many years usually want to, and often insist on, owning a significant part of the pipeline system. These well-known aspects of the pipeline business were either disregarded by AAPL management, or it implies that the management was not well informed about the business they were entering. Again it raises questions related to the serious intentions of the management with regard to construction of this line.

67-21

- When major oil pipelines are conceived and built, it is normal for the owners to establish a large team of experienced engineers to

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67-20 Your comment regarding knowledge of the oil business by AAPL is noted.

67-21 Your comment regarding engineering expertise by AAPL is noted.

67-21 Cont.

execute the project or to hire a large experienced engineering sub-contractor to engineer and manage the project. AAPL did neither of these options. The company hired to do the engineering was not well experienced in the design and construction management of oil pipelines, and there is sufficient evidence available to show that the President, Mr. Roger Williams, reserved the right to make all major decisions, regardless of what the engineers recommended. This aspect, most of all, raises questions about the quality of the work, since it is unknown if some of the major decisions affecting the safety and integrity of the pipeline were made for sound engineering reasons or because of other special considerations; to save money, for instance.

67-22

Throughout some sections of the SEIS bits and pieces of the design effort are referenced. Having reviewed similar previous documents and other project documents in this continuing effort, I find some inconsistencies. One such inconsistency is found on page 2-5 and relates to the corrosion protective coatings. In previous documents, and probably realized on the portions of the line already built, the company proposed a special tar-urethane coating for the hottest sections of the pipeline immediately downstream from the pump/heater stations. In these same documents it was planned and proposed to coat other sections of the line with a thermal insulating jacket of polyurethane foam, and in other sections a wrapping of cold applied polyethylene tape would be used. In the SEIS for the Texas extension they describe only the polyurethane foam and, "The pipe coating, where not insulated, would be a double wrap of plastic tape applied over a hot coal tar base." Here is a technical area where review by knowledgeable engineers would certainly raise some concerns, particularly if the pipeline were to cross very environmentally sensitive areas. Pipe coating is a very important part of any pipeline quality assurance plan, and this project has proposed and used coatings previously untried and untested in the pipeline environment.

67-23

Other parts of the project description or design basis clearly indicate things that will occur in the future if and when the permits to proceed are granted. For instance, on page 2-12 it states,"The pipe used in the construction of the All American Pipeline would be subject to

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67-22 Please refer to the Corrections and Modifications section for page 2-5 for revised information on the Applicant's proposed pipeline coating. Page 4-4 of the Draft SEIS summarizes the results of the engineering evaluation conducted by the SEIS team regarding the proposed pipeline coating. Our conclusion was to require that the coatings be upgraded in certain environmentally sensitive areas. Please see Mitigation Measure SS-7 in Appendix A.

67-23 The commenter correctly states that most of the pipe which AAPL intends to use for this pipeline is in storage in Corpus Christi. However, should coating deterioration occur during the storage of pipe, it would be detected by the holiday inspection conducted during pipe installation and repaired at that time.

67-23 Cont. quality control and inspection procedures throughout the pipe manufacturing and installation process." What the preparers failed to mention, maybe because they failed to make the effort to find out, is that most of the pipe intended for the Texas extension of the line has already been purchased, manufactured, delivered and welded into double joints. Any portion of this pipe that has not been coated is sitting in stockpiles, subject to varying degrees of corrosion depending on where the pipe is and what the elements provide in the way of a corrosive environment. If one were to find objections to the quality control procedures used for controlling the manufacture of the pipe, as I have publically stated, there is nothing that AAPL could do about it if they wanted to since the pipe is already on site ready for construction.

67-24 Two other "bits" of design information appear on page 2-23 which I find to be totally indicative of the minimum standards attitude found throughout documents I have reviewed, or the non-specified "specification" describing a particular part of the work. The statement occurs that, "at a minimum, ten percent of the welds made by each welder each day would be radiographically inspected." It is certainly commonplace on any pipeline to do more than this minimum, and for a critical oil line through sensitive areas a greater degree of radiography should be made mandatory by the company without some authority having to say so. With regard to paragraph

67-25 2.2.2.8 Backfilling, little if anything is said about this critical construction operation. It only says that, "A variety of backfilling procedures.....to comply with specifications regarding protection of pipe and coatings." What specifications are they talking about, and who reviewed them to see if they are recognized industry standards or better. Nowhere do I find any description of how the matter of erosion of the backfill would be prevented on steeper slopes when heavy rains are anticipated. Good practice in the industry would be to have erosion breakers installed at specific intervals. If such a practice is being proposed it should be mentioned in the SEIS.

67-26 On pages 2-29 and 2-30 it is mentioned that "an independent quality control inspector" would be used to monitor activities in two different areas. It is suggested that a single inspector cannot monitor all of the activities at a pipeline construction operation. These statements should

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67-24 Please refer to Mitigation Measure SS-8 (in Appendix A) which requires radiographing of all pipeline welds in sensitive areas.

67-25 Procedures at specific sites are checked by the BLM Authorized Officer who can order modifications if good practice is not used. The ditch plugs identified were common practice for new pipelines. See Modifications and Corrections section for page 2-23.

67-26 The text of the Draft SEIS (pages 2-27 through 2-30) repeats the terms of the agreement between AAPL and the Edwards Underground Water District. BLM can only assume that the District is satisfied with the terms of the agreement.

67-26 Cont. be changed to indicate that "a group of qualified independent quality control inspectors" would do this work.

67-27 In section 4.7 Mitigation Measures, sub-section 4.7.1 System Safety and Reliability, there is at least a partial ray of hope with regard to getting a critical review of the design. It is stated that an independent review and analysis will be done by qualified pipeline engineers. It will be important to find out who selects the group of independent engineers and what their qualifications are. Of more interest will be what actions

67-28 will be agreed by AAPL upon recommendation of the group, since so much has already been decided. Major changes could mean starting some activities from the beginning. In the same section, Measure SS-3, the SEIS provides

67-29 the first revelation that the final design for the Texas segment of the pipeline is not complete. Even if AAPL submits to a truly independent review of the design, the matter of construction inspection is still not totally covered. They have agreed to outside inspection in two critical locations, but there should be a more extensive coverage of this type of inspection.

67-30 Mitigation Measure SS-7 on page 4-178 describes special coatings application to be used in the Edwards Aquifer recharge zone. This information is confusing and provides some more unspecified "specifications" for coatings.

67-31 With regard to the prediction of oil spills, their frequency and the amounts of oil spilled, I can only offer that this is a good exercise in statistical analysis based on hypothetical assumptions. The type of analysis made, based on the Mastandrea report, is grossly unfair to pipelines that have been designed and constructed to the highest industry standards, and it is grossly too liberal to those pipelines designed on the back of an envelope and constructed in an equivalent fashion. This type of analysis, using the "average pipeline", must assume that all pipelines to which it is applied would be designed and built to the same standards. This is simply an exercise in number crunching to arrive at some hopefully useful numbers. I cannot accept assigning an "age factor" to the risk of failure when that age factor is an average of what happened on a variety of pipelines built to different standards quite some time ago. The same thing applies to "diameter factor", "location factor" or

RESPONSE TO LETTER 67

67-27 Please refer to the revised Mitigation Measure SS-3 (in Appendix A) for this information.

67-28 AAPL is obligated to make the necessary changes to the design, construction, and operational practices so as to conform with regulatory codes, should the design review described in Mitigation Measure SS-3 (in Appendix A) uncover any deficiencies.

67-29 BLM, as the agency responsible for the record of decision, has the authority to monitor construction activities to ensure compliance with the project design. Please refer to the Mitigation Measure SS-3 in Appendix A of the Final SEIS. The BLM and the State of Texas will both work in compliance aspects for the All American Pipeline.

67-30 Mitigation Measure SS-7 (see Appendix A) has been modified.

67-31 Please refer to the response to Comment 67-1.

67-31 Cont. any other "factor" based strictly on historical evidence. If the AAPL will have leaks and/or failures, and I believe that it will, they will be caused by the typical human and materials failures that normally cause such failures. Most likely some faults will be built into the system regardless of how well it is designed and constructed. The frequency and type of such failures and the amounts of oil that will be spilled will be greatly influenced by the extent of quality assurance exercised during the design and construction efforts. A copy of my full comments on the Mastandrea report is attached.

67-32 I have a difference of opinion with the preparers of the SEIS with regard to a worst case scenario for an oil spill. Their case is quite well presented, and it is a much better effort than presented in previous documents. However, an example of a "worst case" is whatever the imagination of the party presenting it can come up with. The SEIS case does not reflect what I would consider a practical and probable event with the most serious consequences. The large spill, assuming a separation of the pipeline or at least a large opening, under most operating conditions will be detected soon, and the work to correct and mitigate damage will also be addressed immediately. To me this is not a worst case. Consider the following, which I believe to be a likely event, and place it at a very sensitive location.

67-33 Due to one of a number of real situations and circumstances such as:

- Corrosion
- Pipe settlement on sharp rock
- Imperfection in the pipe not found during manufacture
- Small defect in a field weld that has grown in size
- Damage done during construction that has grown in size

a small leak occurs, years after the pipeline has been put in service. This small leak goes undetected for a long time because it is located in an area that has a direct connection to soils that are porous and feed into the aquifer. The leak is not detected because it is of insufficient volume to be detected by volume and pressure measurements, and none of the oil ever reaches the surface of the land because it feeds directly into the earth. A leak caused by such circumstances most likely would start with a seeping of drops, but with time and the cyclic nature of the pipeline operations it would grow to a drip and then a slow constant flow

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67-32 The Onion Creek to Edwards Aquifer Oil Spill Scenario has been revised; please refer to Appendix B of the Final SEIS.

67-33 Please refer to the response to Comment 64-9 and the Modifications and Corrections section for page 4-6 regarding very small leaks.

and then an ever increasing flow. By the time the operator recognized that there was a possibility of a leak, perhaps after months of noticing discrepancies in the throughput, hundreds or thousands of barrels of oil could have been lost. At that time the operator would start searching for the cause of the loss. If metering equipment exists at each station or some stations, the section containing the leak might be isolated without stopping the operation of the line, and a detailed search with proper instruments might locate the leak. If metering information would not isolate a section for intense investigation, the line could be shut down under pressure, each mainline valve closed, and the pressure in each section checked constantly for a reduction which would indicate a leak.

Because there was no evidence of oil on the surface, and frequent inspections of the right-of-way confirmed this, the first efforts by the operators would be to look for an error in the instrumentation rather than for a leak. A lot of time could pass before there was a serious effort to locate the possible leak, more time would pass before the leak was isolated into a section, and more time would pass before the leak was found and repaired. During these delays, it would be anticipated that the pipeline would remain in operation, since there was no evidence that a leak was occurring, and there was no evidence of or complaints about any environmental damage.

67-33 Cont.

I will leave it to others to determine the amount of oil that could be lost into the aquifer under such circumstances and how much, if any, of the oil could be recovered once the leak was detected. Perhaps someone can establish a range of leak rates that might go undetected for a long period. For instance, a 1 barrel per day leak would probably not be detected by any other means than visual detection of surface contamination, taste detection in adjacent water supplies, or odor detection in the vicinity. Such a leak might go on for years until the oil has reached the main body of the aquifer water and moved to a place where the quality of the water revealed the contamination. Would 2 barrels per day be any more readily detected, and would 2 barrels per day over a 200 day period be a serious contamination? There is some point where such a leak, being unnoticed for a long time, becomes at least one of the possible "worst cases." This type is less forgiving than the one portrayed by the SEIS, since most of the damage is done before anyone knows that the event

RESPONSE TO LETTER 67

67-33 Cont. occurred, and remedial action other than repairing the leak might be fruitless.

P.S.

After preparing the comments on the Mastandrea report and the draft SEIS, I had a chance to review the complaint of the County of Santa Barbara, State of California, to the U.S. Department of Transportation, Office of Pipeline Safety in the matter of Celeron Pipeline Company of California - All American Pipeline Company. The complaint is based on a partial audit ordered by the County of Santa Barbara and performed by some independent experts. What was found during this partial audit are things that I have been stating and expressing concern about since I first started to review documents on this matter. One of the obvious findings of the independent experts was that the engineering and construction management activities performed on behalf of All American Pipeline Company were lacking in technical competence and forceful execution. Some of the mistakes and oversights found are classic errors made by inexperienced engineering companies and owner companies who have a lack of concern about monitoring the construction activities of their selected contractors. I believe that a more complete audit of the engineering, planning, and procurement activities and the already completed actual construction work would reveal many instances of inferior work, much of which would be not in compliance with the existing codes. 67-34

This same type of improper engineering and construction does not have to be continued for the Texas extension of the pipeline, although much of the engineering and procurement has already progressed to a point of no return status. Modifications of the design, increased activity in the areas of quality control and quality assurance, and selection of a route that would not be super-critical should allow the Texas extension to be completed to standards found acceptable to all concerned parties. 67-35

Prepared March 4, 1987

George K. Hickox

George K. Hickox, P.E.

RESPONSE TO LETTER 67

67-34 Your concern regarding the quality of construction for the pipeline already in place is noted; please refer to the response to Comment 66-2.

67-35 Thank you for commenting.

LETTER 68

RESPONSE TO LETTER 68

TEXAS WATER COMMISSION

Paul Hopkins, Chairman
Ralph Roming, Commissioner
John O. Houchins, Commissioner

Larry R. Soward, Executive Director
Mary Ann Hefner, Chief Clerk
James K. Rourke, Jr., General Counsel

March 27, 1987

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

Attached are the comments made by the staff of the Texas Water Commission concerning the Federal Supplemental Draft Environmental Impact Statement covering the All-American Pipeline.

Sincerely,

William W. Thompson, III
Staff Attorney
Texas Water Commission

cc: Dr. William Sheffield, State Coordinator for the All-American Pipeline
Thomas Mason, Director, Water Quality Division, Texas Water Commission

P. O. Box 13087 Capitol Station • Austin, Texas 78711 • Area Code 512/463-7898

LETTER 68

Comments on Draft Supplemental Environmental Impact Statement
Proposed All American Pipeline Project

Since infiltration thru the stream beds is the primary recharge mechanism for the Edwards Acquifer, stream quality and ground water quality are linked. This makes the big concern over the Edwards Acquifer our concern too. Many communities sole source of water is the acquifer.

68-1 What are the impacts on water quality of runoff from construction? The Draft Environmental Impact Statement (DEIS) appears to have found that there is no impact on surface water from construction. It seems likely there will be some.

68-2 Spill control and cleanup (SPCC) plan for the Edwards Acquifer is excellent. Why not most areas of the state wherever sensitive streams are crossed?

68-3 It seems that the SPCC plans need to detail the nearest equipment for emergency control to really be complete.

68-4 Doesn't Spill frequency increase at a known rate over the life of the pipeline? What is the rate of increase?

68-5 The impacts on streams of stream trenching due to turbidity seems to be somewhat under estimated as many are the source of domestic water. ie. sediments are predicted to be deposited in 1 mile. What if it rains at the same time as the sediment causing activity is happening?

68-6 We would like to see more specific information on how the waste water from pipeline hydrotesting is to be disposed of.

68-7 It is apparent that the predictions of impacts are based on an average spill (3400 barrels), however isn't is true that most spills would be infrequent but quite a bit larger (10-15,000 barrels) than the average spill? When the DEIS uses the term "conservative estimate" it appears they mean optimistic estimate.

68-8 Studies of the long term effects on benthic aquatic organisms in the Torey Canyon Crude Oil Spill on the coast of Brittany indicate much longer effects than this DEIS. Effects on Coastal areas may be multiplied because of concentrations in some economically important filter feeders, ie. oysters.

68-9 What is the economic impact of no water for several days on a city, agricultural enterprise, or industry?

68-10 Spill volumes are stated in scientific notation. Is this done to minimize the apparent impacts of large spill volumes?

68-11 What good does the measurement of the percent of oil in a body of water do? Nearly all the oil is on the surface tell us what

RESPONSE TO LETTER 68

68-1 Please refer to the response to Comment 56-108.

68-2 The Oil Spill Contingency Plan will include site-specific plans for sensitive resources. Please refer to the Modifications and Corrections section for page B-53 for a list of proposed locations.

68-3 Thank you for commenting. Detail on the nearest equipment for emergency control will be included in the Oil Spill Contingency Plan prior to BLM approval of the plan as part of Mitigation Measure SS-1 in Appendix A.

68-4 Please refer to Appendix A on page A-3 of the Draft SEIS for information on the variation of spill rate with age.

68-5 Standard practice in river crossing construction is to place dredged bed material on the banks above high water. Therefore, the amount of sediment available to be transported downstream is low. For example, on the Brazos River, if 25 percent of the material that is dredged from the riverbed, for whatever reason, ends up in the river, the estimated average increase in sediment loading is on the order of 20 mg/l. This estimate is based on several assumptions: depth of pipeline burial is 15 feet, 3:1 side slopes, completion of crossing excavation in 25 days, and a flow of 7,000 cfs. The response to Comment 56-108 states that the estimated suspended sediment concentration for an average flow of approximately 7,000 cfs is on the order of 250 to 300 mg/l (5,000 to 6,000 tons/day). Under this scenario, there would be an increase of approximately 8 percent in the sediment load, assuming all sediment being transported from upstream continues downstream past the crossing. The equilibrium condition between amount of sediment being transported and the amount the river is able to carry would be unbalanced which would cause deposition below the crossing until the river reached equilibrium conditions again. Reaching equilibrium conditions may occur within a short distance downstream or several miles depending upon flow rate and the fluvial morphology of the river. Normally, equilibrium occurs within a mile or so downstream of the disturbance for rivers similar in size to those along the pipeline routes.

The above example is based on the average discharge of the Brazos River. At higher flows, the amount of sediment being transported in the river increases dramatically with suspended sediment concentrations of 100 mg/l or more. Thus, the relative increase in sedimentation due to crossing construction becomes insignificant.

68-6 Please refer to the response to Comment 56-100 regarding the disposal of hydrostatic test water.

68-7 At sensitive receptors, impacts were based on the estimated volume from a catastrophic spill at that location. Please refer to the Modifications and Corrections section for page 4-20 for more information on these calculations.

68-8 Your comment concerning the long-term effects of oil spills on marine benthic organisms is noted. A review of additional literature sources (Anderson, et al 1985; Hampson and Moul 1978; Thomas 1977; Straughton 1977) indicate that effects on benthic organisms can range from <1 year to >5 years.

The expected duration of impacts on benthic communities in coastal areas has been revised; please refer to the Modifications and Corrections section for pages 4-54, 4-125, and 4-157.

LETTER 68

68-11 Cont. area of the surface will be covered. They tend to use measures such as: percentage of oil in total flow. How many gallons or barrels of oil?

68-12 This is a very large oil pipeline and it appears that the impacts have been reduced by using optimistic safety and mitigation figures.

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68-9 The economic effect of the suspension of water supply due to oil spill contamination could be considerable. In terms of the number of people affected, a city would be more sensitive than an industry, which would be more sensitive than an agricultural enterprise. While it is not possible to quantify the dollar value of potential impacts due to the many site-specific variables involved, it is reasonable to state that economic impacts could extend into the millions of dollars and could be significant. Factors such as the size of the spill, location of the spill, time of year, time required for cleanup, and types of businesses affected would influence the total economic impact of the suspension of water supply. Part of the solution is alternate water supplies as described in the response to Comment 65-10.

The key factor for most spills is the ability to detect the spill and stop the oil loss and to implement an effective oil spill contingency plan. The Oil Spill Contingency Plan described in Appendix B of the Draft SEIS and accompanying Modifications and Corrections in this document will be implemented under Mitigation Measure SS-1. Please also refer to the response to Comment 18-3.

68-10 Scientific notation is used only to estimate the spill frequency rate in spills per mile-year of pipeline. However, spills are also stated as the number expected over the life of the project for clarity to the public. Please refer to Tables 4-7, 4-37, and 4-49 in the Draft SEIS.

68-11 Please refer to the response to Comment 6-4.

68-12 The Emergency Response Team (Comment 22-3) and Dr. Ralph Cooper of Texas A&M (Letter 18) feel inland pipelines can be very safe if designed and operated properly and if oil spill contingency plans are properly designed and executed. The goal of the BLM is to enforce all the mitigation measures in Appendix A of this document.

LETTER 68

Bureau of Land Management
Draft Supplemental Environmental Impact Statement
Proposed All American Pipeline Project
March 31, 1987

Comments regarding the captioned draft prepared by the staff of the Ground Water Conservation Section, Water Rights & Uses Division, Texas Water Commission follow. Comments from Field Operations Division are attached. Additionally, the comments submitted by the Texas Water Commission in December 1986 addressing spill response in the Preliminary SEIS remain unchanged and serve also as comments for the Draft SEIS.

68-13 The Texas Water Commission (TWC) agrees with the draft's "Major Impact Conclusions" (page S-3, ¶1) that "The All American Pipeline Project has potential construction and operation impacts.", and that "The potential operation impacts would result primarily from oil spill leaks and ruptures." Furthermore, TWC agrees with the statement (from the same paragraph) that "The loss of municipal and irrigation water supplies from an oil spill would be significant."

68-14 The draft states". . . . no one route is significantly better. . . ." (page S-3, ¶4), and further states that such is the case regarding effects on certain specified resources, etc., but makes no such specific claim regarding water resources. Also, other statements in the draft tend to contradict the insignificance. For example, it is stated that where the proposed route crosses the Edwards Balcones Fault Zone Aquifer,". . . . the spill very likely might penetrate into the aquifer in a worst case situation. . . ." (page S-4, ¶1). Additionally, the "Conclusion" (page S-5) includes the statement". . . . an oil spill along the Proposed Route can still pose a significant risk to the Edwards Aquifer, despite an intensive mitigation program." (These statements in the Summary are repeated in the Rationale on pages 2-45 and -46.)

Similarly, data presented in the captioned draft can be readily interpreted to further indicate that significant differences exist between the three routes regarding the potential impacts on ground water. Some such differences are revealed in the following analysis, which is partly statistical.

68-15 In describing the characteristics of some rock types occurring in certain aquifers, and referring to limestone, it is stated in the draft (page 3-7, ¶4) that ". . . . secondary rock characteristics including solution channels, faults, and fractures have a greater effect on groundwater availability and movement than the primary intergranular pore space within the formation." Such secondary features are more characteristic of limestone than other rock types, and this is the primary reason why limestone aquifers are more susceptible to contamination by spills than sandstone aquifers are. It is for precisely this reason that the Edwards Balcones Fault Zone Aquifer probably is the most vulnerable of the aquifers crossed by

RESPONSE TO LETTER 68

68-13 Thank you for supporting our conclusions.

68-14 Please refer to the response to Comment 12-3 regarding the selection of the Agency Preferred Alternative.

68-15 Your comment regarding the vulnerability of the Edwards Balcones Fault Zone Aquifer is noted. Please refer to the response to Comment 1-1.

LETTER 68

68-15 Cont. any of the three routes of this project, as the draft acknowledges (page 23-8, ¶5).

68-16 The foregoing quotation about rock characteristics was made in reference to the Edwards-Trinity Plateau Aquifer. Limestone composes a major portion of this aquifer, and therefore because of the characteristics stated above, the Edwards-Trinity Plateau Aquifer is one of the aquifers most susceptible to contamination by spills that will be crossed by the pipeline. Table 3-1 (page 3-3) shows that the north route will cross 117 miles of this aquifer, the proposed route will cross 191 miles, and the south route will cross 157 miles of it. Therefore, the proposed route presents a 63 percent greater probability, and the south route presents a 34 percent greater probability of contamination of this aquifer by a spill than the north route presents. The proposed route has a 22 percent greater probability than the south route does. This assumes that probability of contamination of a specific aquifer is proportional to length of traverse of the route across the aquifer.

68-17 This appears to be a valid assumption, and it seems to have a rationale similar to the basis of utilizing the "spills per mile-year" factor to determine the "Significant Impacts" that will result from the "Operation" of the three routes, as listed under "System Safety and Reliability" in Tables 4-63 through -65 (pages 4-197, -202, and -207).

68-18 Based on the same assumption, it seems that the probability that ground-water contamination is more likely to occur on any specified route as opposed to any other given route is proportional to a comparison of the total distance traversed across the sensitive aquifers by the respective routes. Also, such a comparison should give a more accurate appraisal of the contamination potential of each route than will a comparison of the number of sensitive aquifers crossed. The total number of miles of sensitive aquifers crossed by the three routes is given in Table 2-12 (page 2-42), as is the number of such aquifers crossed. The total number of miles

68-19 of sensitive aquifers crossed by the three routes is: proposed 401, north 335, and south 418. A comparison of these totals shows that the proposed route poses a 20 percent greater risk than the north route does, the south route has a 4 percent greater risk than the proposed route, and that the south route has a 25 percent greater risk factor than the north route.

For completeness, a similar comparison of the other major aquifers crossed is presented, and the data for the comparison is taken from Table 3-1 (page 3-3).

68-20 The Carrizo-Wilcox Aquifer will be crossed by 16 miles of the north route, 13 miles of the proposed, and by 51 miles of the south route. This shows that a 23 percent greater potential risk exists on the north as compared to the proposed route, a 292 percent greater risk on the south than the proposed, and a 219 percent greater probability on the south than the north route.

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68-16 The probability of contamination of an aquifer is related to the length of the pipeline across the aquifer as well as the potential pathways for oil contamination of the aquifer. The vulnerability of the Edwards-Trinity Plateau Aquifer is discussed in the response to Comment 35-1.

68-17 Your analysis of the rationale is correct.

68-18 The Draft SEIS presents a comparison of the routes with regards to aquifers in general, as well as stream crossings and other receptors sensitive to an oil spill. Please refer to Tables 4-8, 4-38, and 4-50 in the Draft SEIS. We appreciate the comparisons of individual aquifers provided by your comment. Also, please refer to the new groundwater impact summary located in Modifications and Corrections Section 3.4.

68-19 Your comment regarding comparative risk to aquifers by the proposed pipeline route is noted. Please refer to the response to Comment 68-18.

68-20 Thank you for your comment regarding the total distance traversed by the three pipeline routes across this aquifer. A risk factor based on the length of aquifer being crossed by a particular route is noted. Please refer to Mitigation Measure GW-1 in Appendix A which indicates that detailed hydrogeologic investigations will be conducted along each sensitive aquifer. These investigations, in accordance with total distances traversed by each pipeline route across each sensitive aquifer, will provide a reliable and detailed method of determining risk factors for each route.

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68-21 The Gulf Coast Aquifer will be traversed by 149 miles, 146 miles, and 196 miles (page 3-3) of pipeline by the north, proposed, and south routes respectively. Therefore, this aquifer will have a 2 percent greater probability of contamination on the north as compared to the proposed route, a 34 percent greater probability on the south than the proposed, and a 32 percent greater risk on the north versus the south route.

68-22 The Trinity Group Aquifer is traversed by 40 miles on both the north and proposed routes, but the south route does not cross this aquifer (page 3-3). Therefore, the impacts on the north and proposed routes are equal, and this is greater than on the south route, where there will not be an impact.

68-23 In summary, this analysis reveals that significant differences do exist between the three routes regarding possible ground water contamination. The analysis shows that, based on number of miles of aquifer crossed, the probability of contamination of sensitive aquifers (total) is 20 percent greater on the proposed route than on the north route, and that the potential impact of the south route is 4 percent greater than that of the proposed route and 25 percent greater than the impact of the north route. Also, it seems that neither an analysis of this nature, nor its conclusions, were included as part of the subject environmental impact statement.

68-24 This analysis is limited to the possible impact that the subject project will have on ground water. It is based on the assumption that, in regard to potential ground water contamination, if there is any difference in the contamination that may occur along different routes across a homogeneous aquifer, it is directly proportional to the comparative lengths of the respective routes across the aquifer.

68-25 Furthermore, this study shows that additional differences exist between the three routes based on the fact that aquifers composed of different rock types possess a different susceptibility to contamination. There is a considerable difference in the ability of fluids (and gas) to enter and pass through different rock types that is caused by the differences in the natural characteristics of the rocks.

68-26 The Edwards Balcones Fault Zone (BFZ) Aquifer represents the case of high sensitivity to pollution sources. Page 3-8 of the Draft SEIS describes the Edwards (BFZ) Aquifer as probably the most sensitive aquifer crossed by the Proposed Route. The description of the aquifer on subsequent pages is generally accurate but fails to adequately convey the nature of recharge and subsurface movement of water entering the aquifer from the surface on a local scale. The information presented in Section 3 describes regional characteristics.

68-27 Pipeline spills or leaks are acknowledged to have the greatest impact on ground-water resources. Spills generally occur in a small localized area. It is necessary that the SEIS recognize and

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68-21 Please refer to the responses to Comments 68-18 and 68-20.

68-22 Please refer to the responses to Comments 68-18 and 68-20.

68-23 Your comment regarding the comparison of the potential of groundwater impacts by route is noted. Please refer to the groundwater impact summaries for each alternative in Modifications and Corrections Section 3.4.

68-24 Please refer to the response to Comment 68-18.

68-25 Your comment regarding the differences in susceptibility to contamination for different aquifers is noted. Please refer to the Modifications and Corrections section for page 3-3 (Table 3-1).

68-26 Your comment regarding the nature of recharge and subsurface movement of water in the Balcones Fault Zone Aquifer on a local scale is noted. Please refer to Appendix B in the Modifications and Corrections section of the Final SEIS for an example of catastrophic conditions on a local scale.

68-27 Your comment regarding oil spills in relation to site-specific areas in the Edwards Balcones Fault Zone is noted. Please refer to the response to Comment 68-26 and also refer to the response to Comment 33-3 for the status of the Shell Pipeline spill.

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68-27 Cont. evaluate spills in light of the smaller scale characteristics of the Edwards (BFZ) Aquifer. These features should be discussed in more detail than is provided on page 4-32. The Shell Pipeline Spill discussed in the Draft SEIS on page 4-23 provides an example not only of a likely and reasonable spill scenario but also an illustration of the importance of site specific aquifer characteristics.

68-28 While for this spill, response and surface mitigation measures were effective, the effect on ground water has not yet been determined. Evaluation of site-specific, geologic features is essential to determining the effect on ground water. The spill surface is characterized by near surface fractures and solution cavities not easily observed at the surface and which provided avenues for downward migration. In the vicinity of the spill area are numerous caves, a major fault, and a segment of Slaughter Creek where significant stream loss has been measured (Slade, et.al.; 1983-Draft SEIS References). These features have had a significant effect on the migration of the volatile fraction of the spill and on the investigation to determine if ground-water contamination has occurred. These features may have had a much greater effect had the spill occurred even one-third of a mile further east.

68-29 The effects of these features, characteristic of the Edwards (BFZ) Aquifer, at a local scale on contaminant movement, investigation of the contamination, and remedial action are not adequately addressed in the Draft SEIS. These issues are complicated, and the required detailed study and evaluation have not been made by BLM in the Draft SEIS. The Shell Pipeline Spill presents an opportunity to address some very important aspects of spill impacts on ground water. The Draft SEIS fails to provide up-to-date information regarding the spill (on page 4-23 the most recent information cited was dated October 1986) and conveys the impression of limited damage when in fact the investigation for ground-water impacts was still in an early stage. The Final SEIS must provide a more detailed and more up-to-date discussion of the efforts to determine ground-water impacts at the Shell Pipeline Spill. It should be noted that because of the complex characteristics of the aquifer a first sampling of potentially affected ground water had not yet been completed 9 months after the spill occurred.

68-30 In light of the amount of time and resources devoted to date on the Shell Pipeline Spill to unravel a complex hydrogeologic puzzle, the "probable worst-case scenario" described in Section C of the Draft SEIS should be reevaluated. Following are comments on the description of the Spill Event given in Section C starting on page C-2 from the perspective gained by the writer during his investigations of the Shell Pipeline Spill for the Texas Water Commission.

68-31 . A total spill volume of 3,230 barrels assumes <u>flawless</u> operation of remote control block values.

RESPONSE TO LETTER 68

68-28 Your comment regarding site-specific details of the Edwards Balcones Fault Zone and their importance with regard to the Shell Pipeline spill is noted.

68-29 Your comment regarding the timeliness of information on the Shell Pipeline spill in Travis County, Texas is noted. ERT contacted the City of Austin and the TRRC in May of 1987. Please refer to page 4-23 of the Modifications and Corrections section of the Final SEIS for a case history update.

68-30 through 68-36 The Onion Creek to Edwards Aquifer oil spill scenario has been revised; please refer to Appendix B of the Final SEIS.

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68-32 It is highly unlikely, and certainly not a plausible worst case, that the spill prevention team with heavy equipment will arrive in 2 hours 30 minutes. The soils are clayey and roads are barely negotiable in wet weather.

68-33 ..."The rain has washed 1,298 barrels of crude oil into the swale,..." (page C-4). This remark requires substantiation and some further discussion in the SEIS. The remark implies that nearly 2000 barrels remain in the spill area. A proper consideration of the situation would discuss qualitatively, at least, the likelihood of the oil moving downward into the subsurface in the spill are and along the swale.

68-34 The discussion of the volumes and rates of oil discharge and runoff discharge to Onion Creek may not reflect a probable worst case. A more localized rainfall event of perhaps shorter peak duration would mobilize oil to Onion Creek while at the same time contributing only enough runoff for the total flow in Onion Creek to be lost to recharge. In this case most of the oil discharged to the creek would find its way into the aquifer.

68-35 Considering the summary of crude lost on page C-5, 77 barrels introduced to the aquifer from Onion Creek is an extraordinarily low estimate and is not even in the ball park for a probable worst case.

68-36 Also in the summary on page C-5, 93 barrels lost to the subsurface is also an extraordinarily low estimate. Page 4-23 of the Draft SEIS cites a City of Austin estimate of 200 barrels lost to the subsurface at the SHell Pipeline Spill. This seems to be a realistic estimate. It should be noted that the spill occurred at a site considerably less conducive to subsurface penetration than many other possible spill sites and represents, perhaps, even a best case for oil loss to the subsurface. A possible worst case spill event for the All American Pipeline should consider a subsurface loss of oil at least 5 times greater. This case is not at all unreasonable given the nature of the Edwards (BFZ) Aquifer. Highly porous and permeable rock often occurs at the surface with little or no soil cover.

68-37 In conclusion the probable worst case spill event described in the draft SEIS is not a worst case. BLM should update their information on the Shell Pipeline Spill and significantly revise the possible worst case spill event in the Final SEIS. The impacts on the Edwards (BFZ) Aquifer are too significant and the consequences too great to minimize their treatment in the SEIS.

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68-37 The information on the Shell Pipeline oil spill has been updated. Please refer to the response to Comment 33-3 and the Modifications and Corrections section for page 4-29.

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Draft Supplemental Environmental
Impact Statement

U.S. Department of the Interior
Bureau of Land Management

All American Pipeline Project
January, 1987

General

68-38 The subject SEIS, prepared by ERT Engineering Company for the Bureau of Land Management, concludes that the Northern Alternative route for the final leg of the All American pipeline project is the preferred route. I agree with this conclusion in that, (1) the Edwards Aquifer recharge zone is bypassed, (2) the pipeline would cross less of the outcrop of the Carrizo-Wilcox aquifer than the other alternatives and, (3) a smaller area of the Edwards-Trinity Plateau aquifer would be impacted as compared with the other alternatives.

Specific Comments

68-39 (1) Table 3 - 7 titled, "Sensitive Geologic Features" (page 3 - 27), notes a karst area in Kerr County (location is shown on Map 3 - 3). The Edwards Aquifer recharge zone (Balcones Fault Zone) in Hays County should also be cited as a karstic area.

68-40 (2) Section 3.2.4.6, titled "Karstic Terrain" (page 3 - 30), notes the Edwards Balcones Fault Zone as being fractured, faulted, vugular and containing numerous caves and sinkholes. However, this area is not termed "karstic" as it does not pose a geologic hazard to the pipeline. It would seem that actively subsiding terrain is a chief concern for pipeline integrity. However, from the standpoint of ground water quality protection, the sensitivity of karstic features, whether active or inactive, cannot be overstated.

68-41 (3) Section 4.2.2.2. titled, "Construction", (page 4 - 26), discusses the potential affects of blasting for trench excavation on nearby water wells on the Proposed Route. It is stated that All American proposes to utilize blasting "...only on a very limited portion of the route...". Although I am not aware of data which could link such blasting to long-term water well problems, it seems reasonable to imagine that much of the trench excavation on the Proposed Route would be accomplished by blasting . The indurated limestone of the Edwards - Trinity Plateau and Edwards Balcones Fault Zone formations comprises approximately 50% of the length of the Proposed Route.

RESPONSE TO LETTER 68

68-38 Your comment regarding support for the Northern Alternative is noted.

68-39 Your comment regarding the Edwards Balcones Fault Zone in Hays County is noted. Overall, karstic terrain and active karstic processes do not appear to pose a geologic hazard to the pipeline or surface structures. However, local circumstances may indicate a need for additional mitigative measures during construction. Please refer to Mitigation Measures G-1 and G-2 in the Modifications and Corrections section of the Final SEIS.

68-40 Your comment regarding the sensitivity of the Edwards Balcones Fault Zone Aquifer is noted. We agree that the fractured, vugular nature of the aquifer must be taken into account when considering groundwater quality. In support of this statement, please see page 2-28 through 2-29 of the Draft SEIS, and pages 3-8 through 3-13 and 4-31 through 4-33 of both the Draft SEIS and the Modifications and Corrections section of the Final SEIS. Also please refer to the response to Comment 1-1.

68-41 Experience in blasting has shown no structural damage is evidenced when peak particle velocities are maintained at less than 2 inches per second. Design of a blast sequence to accomplish this is dependent on several factors, among them type of explosive used and properties of the rock, charge size, and distance. An implication of charge size is delayed, or sequential blasting, wherein multiple shots are fired with millisecond delays, thereby reducing the instantaneous propagation intensity for a given blast pattern.

Where it is determined, mathematically or through field application, that particle velocities below 2 inches per second cannot be achieved in the proximity of a water well, mechanical ripping of the strata could be used in lieu of blasting. Please also see Mitigation Measure G-5 and the response to Comment 66-37.

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INTERNATIONAL PIPELINE ASSOCIATES
PIPELINE ENGINEERS
3724 ARMSTRONG AVENUE
DALLAS, TEXAS 75205

CABLE: HYCON

TEL (214) 522-1767

March 26,1987

William Haigh,Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside,California 92507

Gentlemen:

Re: Draft EIS
All American Pipeline Project

We enclose herewith comments regarding the Draft Environmental Impact Statement for the Texas extension of the All American Pipeline Project.

These were prepared at the request of Mr. James W. Collins, Chief Civil Section, County of Travis, Austin, Texas 78767, and are based on my forty years of experience in pipeline engineering, design, and construction both in the United States and abroad. I copy of my resume and business experience is enclosed for your information.

The present financial and business organization of Celeron Corporation and Celeron All American Pipeline Company make it important that independent and competent oversight be provided to insure that the proposed pipeline and pumping stations and terminals are properly designed and constructed since the management and operation of the company may not be in the hands of the group responsible for constructing and commissioning of the system.

Sincerely yours,

INTERNATIONAL PIPELINE ASSOCIATES

H. Yellin

HY:md
Enc.

2-305

Hy Yellin
3724 Armstrong Parkway
Dallas,Texas,75205
Business Telephone: 214-522-1767 Residence Telephone: 350-5174

General Information

Broad background in all phases of engineering, design, economics construction management and administration of contracts for engineering and construction worldwide. Experienced in the design of crude oil and refined product pipelines,gas gathering and transmission systems, pumping and compressor stations, storage facilities, tanker terminals, and preparation of feasibility studies and reports.

Education and Affiliations

Bachelor of Science in Mechanical Engineering,Northeastern University Boston,Massachusetts,1943
Registered Professional engineer, State of Texas.
Registered Professional engineer,State of Alaska.
Texas and National Society of Professional Engineers
Society of Petroleum Engineers of AIME
Instrument Society of America
Northeast Texas Gas Measurement Association
Natural Gas Society of North Texas

Background

First assignments in the oil and gas industry were with Stone & Webster Engineering Company in Boston in 1947 and were in design of compressor stations and underground gas storage fields in Kansas and Illinois, Next assignment was with Pipeline Engineering Company in Tulsa and Edmonton, Alberta in charge of the design of pumping stations and storage terminals for the Interprovincial Pipeline project then at Allentown,Pennsylvania for the design of the Buckeye Pipeline Company Eastern Product Pipeline System and other projects.After completing the above, transfered to the companies home office in Dallas and worked on the design of projects in Texas and South America.In 1957, purchased the physical assets, client lists and files and goodwill of Pipeline Engineering Company and established International Pipeline Associates in Dallas. In 1971 became a partner and officer in Petrochem International Corporation. This arrangement was terminated the following year and International Pipeline Associates resumed independent operations.

Experience Record

INTERNATIONAL PIPELINE ASSOCIATES, Dallas,Texas 1972 to Present
Principal of consulting engineering company providing consulting engineering services directly or in association with various consulting engineering firms (See Project List, sheet 2-7)

PETROCHEM INTERNATIONAL CORPORATION,Dallas,Texas 1971 to 1972
Vice President and partner responsible for international operations, engineering, design and preparation of feasibility reports and cost estimates

INTERNATIONAL PIPELINE ASSOCIATES, INC,Dallas,Texas 1957 to 1971
President and principal owner responsible for administration of engineering,design,management and construction operations of IPA and for operations of Affiliate company engaged in custom design

and manufacture of control systems and measurement systems.
See Project List Sheets 2-6)

PIPELINE ENGINEERING COMPANY,Dallas,Texas 1948 to 1957
Vice President and Chief Engineer, responsible for contract negotiations management and supervision of engineering and design for major pipeline projects, (See Project List Sheet 1)

STONE AND WEBSTER ENGINEERING COMPANY,Boston,Mass. 1947 to 1948
Design Engineer on compressor stations, Tank farms, gas storage facilities and refinery offsite facilities.

ALUMINUM FURNITURE COMPANY,Boston,Mass 1946 to 1947
Engineer and plant manager, product development and tooling

U.S. NAVY 1944 to 1946
Service Schools in engineering and electronics, assistant to engineering officer, USS Altair, Destroyer Tender, Pacific Fleet

CHANCE VOUGHT-VOUGHT SIKORSKY AIRCRAFT, Stratford,Conn. 1943 to 1944
Project engineer in experimental department development of sandwich type composite structural aircraft panels.

LAPOINTE MACHINE TOOL COMPANY, Hudson,Mass 1939 to 1943
SANBORN COMPANY,Boston,Mass
Machine Tool design draftsman and machinist and tool maker apprentice(Cooperative work plan with Northeastern University)

PERSONAL INFORMATION
United States Citizen, Height 5'8" Weight 165#, No dependents, Health excellent, Interests: Music,Theater, Antiques,Travel

By Yellin
(2)

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INTERNATIONAL PIPELINE

ASSOCIATES

CAPABILITIES AND SERVICES AVAILABLE

FEASIBILITY STUDIES AND REPORTS

PROPERTY APPRAISALS

EXPERT TESTIMONY

ENGINEERING AND DESIGN SERVICES AS FOLLOWS

- NATURAL GAS GATHERING AND TRANSMISSION SYSTEMS
- OIL AND GAS PRODUCTION FACILITIES
- PUMPING STATIONS
- COMPRESSOR STATIONS
- CRUDE OIL AND PRODUCT PIPELINES
- CRUDE OIL AND PRODUCT TANK FARMS AND BULK PLANTS
- LPG TERMINALS
- MARINE TERMINAL SHORE FACILITIES
- CONSTRUCTION MANAGEMENT
- PROCUREMENT AND EXPEDITING
- FIELD INSPECTION
- AS BUILD RECORDS AND PLANS
- GENERAL DRAFTING AND DESIGN

INTERNATIONAL PIPELINE ASSOCIATES, 3724 ARMSTRONG PARKWAY
DALLAS,TEXAS 75205
TEL. 214 522-1767

REV. 1-14-86

Refinadora Costarricense de Petroleo
Limón — San José Pipeline

El Paso Natural Gas Products Co.
Odessa — El Paso Pipeline

Creole Petroleum Corp.
Lagunillas — La Saline Pipeline

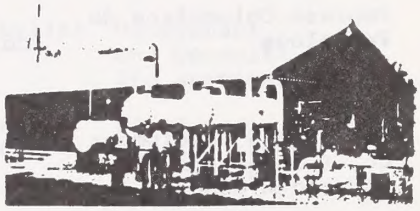
Oleoducto del Pacífico, S. A.
Buenaventura — Cali Pipeline

Creole Petroleum Corporation
30" Temblador — Caripito Pipeline

Creole Petroleum Corp.
La Saline Marine Terminal

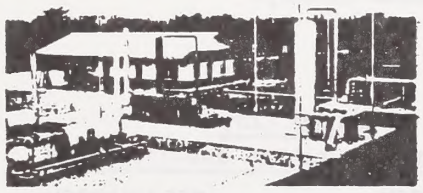
San Andrés Development Co.
El Tablón — Mamonal Gas Measurement Station

Buckeye Pipeline Company
Eastern Products Pipeline



Oleoducto del Pacífico, S. A.
Yumbo — Cartago Pipeline

Tuscarora Pipeline Co.
Blaine Pumping Station



San Andrés Petroleum Co.
El Tablón Mamonal Gas Pipeline

Empresa Colombiana de Petróleos
Puerto Salgar — Bogotá Pipeline

LETTER 69

INTERNATIONAL PIPELINE ASSOCIATES

PROJECT LIST

CLIENT	LOCATION	DESCRIPTION	SERVICES	VALUE
Empresa Colombiana de Petroleos	Colombia	Puerto Salgar Product Pipeline terminal and tankage	Engineering Design Insp.	$1,000,000
Interprovincial Pipeline Company	Canada	Alberta-Wisconsin Crude Oil Pipeline System	Station & Tank Farm Eng. & Design	20,000,000
Buckeye Pipeline Company	U.S.A.	Eastern Product Pipeine System, Pumping Stations and Tankage	Engineering and Design	35,000,000
Tuscarora Pipeline Company	U.S. A.	Pumping Stations (3)	Engineering and design	1,500,000
Andian National Oil Company	Colombia	Booster Pumping Station(3) Crude Oil Pipeline	Engineering and Design	3,200,000
Empresa Colombiana de Petroleos	Colombia	Galan-Cantimplora Pipeline and pumping stations	Engineering and design	4,000,000
Compania Colombiana de Gas	Colombia	LPG Terminal, Bogota, Colombia	Engineering and design	800,000
Creole Petroleum Co.	Venezuela	34" Lagunillas-La Salina Pumping Station and Tankage	Engineering Design & Insp.	15,000,000
Shell Oil Company	Venezuela	Lake Maracaibo Marine Terminal	Feasibility studies and Estimates	50,000,000
El Paso Products Co.	U.S.A.	Odessa-El Paso Product Pipeline and Pump Stations	Engineering and Design	10,000,000
Creole Petroleum Co.	Venezuela	La Saline Marine Terminal and tank farm	Engineering and design	50,000,000
Kuwait Oil Company	Kuwait	Persia[illegible]nker Loading Facili[illegible]	Consulting Engineering Review	(-)

PROJECT LIST

CLIENT	LOCATION	DESCRIPTION	SERVICES	VALUE
Oleoducto del Pacifico, S.A.	Colombia	Buenaventura - Cali Product Pipeline System, Pumping Stations and Terminal	Engineering Design and Construction Management	5,000,000
Creole Petroleum Co.	Venezuela	30" Temblador-Caripto Heavy Crude Oil Pipeline and Pumping Stations	Turnkey Eng. Design and Construction	25,000,000
National Iranian Oil Company(William Bros)	Iran	Persian Gulf Tabker Loading Terminal	Preliminary design and feasibility study	(-)
Empresa Colombiana de Petroleos.	Colombia	Galan LPG Plant	Engineering and design	1,000,000
Oleoducto de Pacifico S.A.	Colombia	6" Cali to Cartago product pipeline system	Engineering design and construction management	4,000,000
Empresa Colombiana de Petroleos	Colombia	Puerto Salgar to Bogota Pipeline System Modernization	Engineering design and inspection	5,000,000
San Andres Develpment Co. & International Petroleum Company	Colombia	Jobo Tablon - Cartegena Natural Gas Transmission System	Engineering design and Construction Management	10,000,000

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(2)

PROJECT LIST

CLIENT	LOCATION	DESCRIPTION	SERVICES	VALUE
Refineria Costariccense de Petroleo S.A.	Costa Rica	Limon to San Jose Product Pipeline System, pumping stations, terminal and submarine lines	Turnkey engineering and construction	5,000,000
Southern Union Gas Co and Theiss Bros, Pty	Australia	Roma- Brisbane Gas Pipeline	Construction Management	20,000,000
Cabinda Gulf Oil Co.	Portugese W. Africa(Angola)	Offshore Pipelines, On shore tank termiinals	Construction management & inspection	(-)
Plantation Pipeline Co.	U.S.A.	Collins Terminal Tank Farm	Preliminary design and Feasibility Report	(-)
CEPE and Ferrocarriles del Estado.	Ecuador	Quayaquil(Duran) to Quito Refined Petroleum Product Pipeline and Pumping Stations	Engineering design and Construction management	8,000,000
Government ofGuatemala	Guatemala	Puerto Barrios - Escuinla to Guatemala City Product Pipeline System	Feasibility studies and reports	(-)
Hunt Oil Company	U.S.A.	Tuscaloosa Crude Oil Pipeline system	Pumping Station Design	(-)

(3)

PROJECT LIST

CLIENT	LOCATION	DESCRIPTION	SERVICES	VALUE
High Plains Natural Gas Company	U.S.A.	Natural Gas Pipeline System, Texas	Inspection and appraisal report.	(-)
Buckeye Pipeline Co.	U.S.A.	Texas-Florida 30" Product Pipline System Stations and Terminals	Economic Feasibility Study and Report	(-)
W. R. Grace & Company (Standard Transmission Co.)	U.S.A.	Oklahoma and Arkansas Pipeline Terminals	Inspection and appraisal report	(-)
		Alabama Product Terminal	Spill Prevention Plan	(-)
Florida Power and Light Company(Turner, Mason, Solomon)	U.S.A.	Heavy Fuel Oil Tanker terminal and Pipeline system for Power Plant Fuel Supply	Feasibility Studies and Reports	(-)
Utilities Pipeline Company	U.S.A.	Wichita Falls - Dallas Pipeline System	Management and Consulting services	(-)
Fertilizantes de Centro America S.A.	El Salvador	Acajutla Anhydrous ammonia tanker unloading system	Field inspection, study and reports	(-)
	Costa Rica	Puntarenas Offshore mooring and submarine unloading system for anhydrous ammonia	Feasibility Study and Report	2,000,000

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INTERNATIONAL PIPELINE ASSOCIATES

PROJECT LIST

CLIENT	LOCATION	DESCRIPTION	SERVICES	VALUE
Federal Energy Administration	U.S.A.	Preliminary design,estimates Bryan Mound Freeport Texas Strategic Petroleum Reserve Facility.	Engineering and design, Estimates	(-)
Miller Brewing Co.	Auburn,N.Y.	Gas gathering , transmission lines and M & R Facilities (Subcontract from GMSCO)	Engineering and Design	$5,000.000
Omni Exploration Inc.	Terrell,Tx.	Natural Gas Production Plant. (subcontract from GMSCO)	Engineering and Design	$1,000.000
Crystal Oil Company	Longview,Tx.	Pumping Station, Product tank farm and injection facilities. (Subcontract from Purvin & Gertz)	Engineering and Design	$2,000.000
Winston Refining Company	Ft. Worth,Tx.	Texas Utilities Tank Farm Ft. Worth,Tx.	Field Survey & valuation report.	(-)
Amber Pipeline Company	Bowie,Tx.	Pipeline extension and delivery facility Miscellaneous Consultations	Engineering and design	$200,000
Texas Oil and Gas Co.	Texas & Oklahoma	Gas Production and compression facilities at various locations. (Subcontract from GMSCO)	Engineering and design	(-)
Peoples Gas Company	Illinois	Manlove Sorage Field Gas compressor station, 8000HP. (Subcontract from FB&D)	Engineering and design	$4,000,000
Petroleos Colombo Brasilero S.A.	Colombia	Dina-Giradot-Bogota heavy crude oil pipeline system	Field Survey Preliminary engineering and design	(-)

INTERNATIONAL PIPELINE ASSOCIATES

PROJECT LIST

CLIENT	LOCATION	DESCRIPTION	SERVICES	VALUE
STANDARD Transmission Company (Div. of W.R. Grace)	U.S.A.	South Carolina Product Pipeline System	Feasibility Study and Report	(-)
City of Bowie,Texas	U.S.A.	Relocation of gas gathering lines for construction of planned water reservoir.	Field survey reports and consultations	(-)
Graves,Dougherty,Hearon and Moody	U.S.A.	Oil Spill damage evaluation survey and consultation services in connection with pipeline leaks.	Field survey reports and consultations.	(-)
U.S. Department of Interior and Husky Oil NPRA Operations Inc.	U.S.A. (ALASKA)	Barrow Natural Gas Field Gas Gathering and Transmission system. Barrow, Alaska (Subcontract from GMSCO)	Feasibility Studies and reports and Engineering and design of facilities	(-)
Dorchester Refining Co:	U.S.A.	Greenville,Texas. refined product tank farm and truck loading facility,(Proposed) (Subcontract from GMSCO)	Engineering preliminary design and cost estimates	(-)
Greer Petroleum Co.	U.S.A.	Oil Field Production Facility Padre, Island,Texas (Subcontract from GMSCO)	Engineering and design	(-)

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INTERNATIONAL PIPELINE ASSOCIATES

PROJECT LIST

CLIENT	LOCATION	DESCRIPTION	SERVICES	VALUE
Southwest Airlines, Hudson General and the City of Houston	Texas	Modernization of aviation fueling facilities, Hobby Int'l Airport	Engineering and Design	(-)
Carswell Pipeline Co. (Pride Refining Co.)	Texas	Abilene-Aledo-Carswell Product Pipeline System	Consulting Engineering- Hydraulics. (Sub contract from Ancira Engineering Services)	(-)
Amber Pipeline Co.	Texas	Pipeline relocation Grapevine,Texas. Pipeline Re-route Summerfields (Ft. Worth) Texas	Construction Supervision and inspection	(-)
Esperanza Pipeline Company	Texas	Gas Gathering Systems Tom Green County Goliad County Dewitt County Sterling County Compressor Station Carlsbad,Texas	Preparation of AFE's Engineering,Design, Procurement,Expediting Construction Supervision and Inspection	(-)
Enpro	Texas	Crude Oil Stabilization Plant, Henderson County,Texas	Consulting Engineering services	(-)
Hadson Gas Systems Inc.	Oklahoma	Gas Gathering Systems Holly, Mistletoe and Ivy Systems	Engineering, Design Procurement and expediting	(-)

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LETTER 69

MEMORANDUM

Submitted by

INTERNATIONAL PIPELINE ASSOCIATES

Dallas,Texas

Re

PROPOSED ALL AMERICAN PIPELINE PROJECT

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

January, 1987

Prepared by
H. Yellin
February 16,1987

MEMORANDUM INDEX

ITEM	SUBJECT
1	Station Design
2	Communication System
3	Pipeline Leak or Spill Scenario
4	Station and Terminal Leaks or Spills
5	Fire Protection
6	External Pipe Coating System
7	Cathodic Protection
8	Internal Pipeline Corrosion
9	Applicable Codes and Standards
10	Special Conditions
11	Block Valves
12	Hydrostatic Testing
13	Non Destructive Testing
14	Cleanup and Restoration
15	Proposed DOT Rulemaking

LETTER 69

ITEM 1 STATION DESIGN - GENERAL

69-1 The description of the design of the pump/heater stations does not adequately describe or evaluate the provisions for accomodating oil drains or spills during normal operations and maintenance or when emergencies occur.

69-2 In addition to the normal risk involved in remote operated crude oil pumping stations, there is added risk when oil is heated using direct fired crude oil heaters fueled by natural gas. Minimum requirements for prevention of

69-3 environmental damage should include provisions for confinement of oil drains, provisions for storage and recovery of oil drains or spills, addition of curbs and dikes, provisions for oil water separators, retention ponds and monitoring equipment to detect the release of oil from the station or terminals.

69-4 Site specific Spill Prevention Control and Containment Plans should be prepared and placed into effect before the proposed pipeline system is placed into operation.

RESPONSE TO LETTER 69

69-1 The All American Pipeline is required to meet all applicable codes, regulations, and standards for pipeline design. These requirements include oil drains at the pump/heater stations as suggested by the comment. It is expected that most operational and maintenance spills will occur as a result of pigging operations. Standard industry design practices include drains located at each pig launcher and receiver. The addition of curbs, dikes, retention ponds, etc. are deemed to be unnecessary in terms of station design because of the expected small volume of most operationally-related oil spills. These and similar measures suggested in the comment are in excess of standard industry practice.

69-2 The analyses conducted as part of the Draft SEIS have not determined that the natural gas-fired crude oil heaters pose any significant environmental risks. Please refer to the Modifications and Corrections section for page 4-5 which explains this conclusion more fully.

69-3 Please refer to the response to Comment 69-1.

69-4 Mitigation Measure SS-1 (in Appendix A) requires that an Oil Spill Contingency Plan be submitted six months before the pipeline goes into operation. DOT regulations 49 CFR Part 195 also requires an Oil Spill Contingency Plan prior to operation.

LETTER 69

ITEM 2 COMMUNICATIONS SYSTEM

69-5 The DSEIS recommends in section 4.7.1. Systems Safety and Reliability Measure SS-6 that a radio backup communication system or equivalent will be provided for pipeline operation.

This recommendation needs to be made more specific. It should should include provision for standby power for operation of the radio backup system, the supervisory control system at the control headquarters and at the pump/heater stations, terminals and remote controlled block valves.

RESPONSE TO LETTER 69

69-5 AAPL has included standby power for the supervisory control system at the pipeline control headquarters. Details are given in the Modifications and Corrections section for page 2-31. In addition, as a fail-safe measure, AAPL's stated procedure is to shutdown the pipeline in the event of a total loss of power from the supervisory control system. Please see Mitigation Measure SS-6 in Appendix A.

ITEM 3 PIPELINE LEAK OR SPILL SCENARIO

Pipeline accidents which cause significant property loss environmental pollution and /or loss of life and injury are subject to investigation by the National Transportation Safety Board, Washington DC 20594 and the Texas Railroad Commission. In 1978 the NTSB issued a study entitled " Safe Service Life for Liquid Petroleum Pipelines" The report states that the principal cause for pipeline accidents was corrosion followed by damages caused by equipment damaging the pipeline. The 1984 Annual Report on Pipeline Safety issued by DOT indicated that damage by outside forces now is the leading cause of pipeline failure (26%) followed by external corrosion (19%) 69-6

During the early years of operation of a pipeline corrosion is not usually a cause of pipeline failure but the possibility of failures by external corrosion increase with age and deterioration of the pipeline coating materials.

Line damage by equipment is difficult to predict on the basis of statistical analysis. It is likely to occur with greater frequency in those locations where present or future construction operations are likely to occur or where intensive farming operations involving deep plowing and irrigation systems are involved. This type of damage is less likely to occur in pasture or ranch land.

The leak analysis in the DSEIS does not consider the effects of increased stress induced in the pipeline and 69-7

69-6 The statistics on pipeline spills cited in the Draft SEIS are based on a major pipeline safety study commissioned by the EPA. Although the statistics in that report may seem somewhat outdated, a review of more recent statistics from the DOT does not change the basic conclusion that outside force and corrosion incidents remain the leading causes of pipeline spills. Granted, the statistics vary somewhat from year-to-year for the different types of incidents as indicated by the comment. However, the values used in the SEIS were primarily for illustrative purposes and not for generation of explicit numerical estimates of spill probabilities. DOT spill statistics for 1976 to 1985 have been summarized in Table 4-3A in the Modifications and Corrections section.

69-7 The pipe expansion and contraction noted by the comment is not believed to pose significant additional risks to the probability of a spill or rupture from the All American Pipeline. The coating proposed by AAPL is designed to withstand temperatures up to 180 °F without breakdown. In addition, the anticipated pipeline operation is such that oil temperature will fluctuate only when changing crude oil shipments. Thus, the expansion and contraction noted by the comment will not occur regularly, but rather only periodically throughout the year.

LETTER 69

coating system in a heated oil pipeline caused by heating and cooling cycles.

Assuming that a 100 degree fahrenheit temperature range is experienced between hot and cold pipeline operating temperatures, for example, between 60°F and 160°F, the

69-7 Cont. estimated expansion from the cold to the hot condition will be 1.25 inches per 100 feet or 5.50 feet per mile. This is considerably greater than experienced by unheated pipelines operating at ambient temperatures which are subject to much smaller seasonal temperature changes. Temperature related stresses may induce failures in the pipe unless adequately compensated for and may cause faster deterioration of the pipe coating.

The leak scenario presented in the DSEIS represents that the ALL American leak detection system would detect a 21 barrel per minute leak in 10 seconds or a .02 barrel per minute leak in 36 hours. It does not address itself as to what the All American operating staff would do with this information.

69-8 For example, how long will the system continue to operate while the data from the leak detection instrumentation is being evaluated, the instrumentation and computers checked for glitches and if the data found to be accurate, a field investigation is made to confirm the leak by aerial and ground survey.

If so, how much time might elapse before indicated leaks of various rates at various locations would be found and

RESPONSE TO LETTER 69

69-8 Please refer to the Modifications and Corrections section for page B-15, Section 2.5 of the Oil Spill Contingency Plan which expands on procedures in the event a leak is detected.

how much would the total amount of spill be before the line was shut down and repair and cleanup crews dispatched to the spill site.

In actual operations it may be impossible to find a leak if the pipeline is shut down as small leaks may close off when pressure in the pipeline is reduced. Small leaks at the bottom of the pipeline trench may not show up readily.

Will the pipeline operating proceedures require that the system be shut down while the nature and location of a leak is found or will the proceedure allow that operations continue, perhaps at reduced system pressures while attempts are made to locate and repair an apparent leak.

69-8 Cont.

Assuming a pipeline tariff of $3.33 per barrel and a thruput of 300,000 barrels per day, the gross revenue loss for each day the pipeline is shut down is $1,000,000.00.

While the response by All American pipeline to a major line break such as might be caused by construction equipment or washout of a river or stream crossing will be immediate because of the size of the spill which permits rapid verification, the response to small leaks such as are capable of being detected by the proposed state of the art leak detector has not been addressed in the DSEIS. These small leaks which may seep into the ground and cause contamination of water supplies and take considerable time to confirm, detect and locate. If for example

it takes two weeks to locate a .02 barrel per minute leak which is a reasonable assumption, the amount of oil contamination would be 446 barrels. The value of this oil at the current average West Texas Crude price would be $8,028.00. The loss of revenue if the pipeline was shut down 24 hours after the apparent leak was detected by the deak detection computer could be up to $13,000,000.00

69-8 Cont. Under these circumstances, the management policy regarding proceedures to be followed in the event of the leak detection computer indicating that a possible leak exists are vital in insuring that environmental damage will be a major consideration as it will in many cases be more profitable to continue to operate until a leak was located even though cleanup costs may be higher since the loss of operating income could be much greater than the cost of cleanup and damages.

69-9 The effectiveness of the proposed leak detection system during transientconditions of pipeline startup, pipeline shutdown, loss of one or more pumping units heaters or pump stations has not been addressed. It is expected that the capability of the leak detection system will be greatly reduced during transient conditions.

69-10 As with the communications system, back up leak detection capability by more conventional methods should be provided. These might include meter balances, pressure, temperature and flow rate checks, tank gages etc. by conventional methods. The detection capability by conventional methods

69-9 The comment correctly states that the leak detection system will not perform up to design standards during periods of transient operating conditions. However, this temporary reduction of the leak detection system sensitivity is unavoidable. These periods are expected to be infrequent and as such the temporary loss of leak detection capability is not significant.

69-10 The backup for the leak detection system will be provided by a totally redundant computer system at the supervisory control center.

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69-10 Cont. would provide a worst case scenario should the computer based state of the art leak detection system be disabled.

It is suggested that the parameters for evaluating the data from the proposed state of the art leak detection system and conventional leak detection methods be included as a separate section of the DSEIS as part of the Oil Spill Contingency Plan. A suggested heading for this section would be " SUPERVISORY CONTROL OF LEAKS AND OIL SPILLS. This section should include typical data obtained from the proposed leak detection system and back up system and the proposed response required by the pipeline operator. The following is an example :

69-11

Leak or Spill Response Proceedures

NOTIFICATION BY	INDICATION	SUPERVISORY RESPONSE	FIELD RESPONSE
Leak Detection System	Minor leak or spill ( ) BBl/Min or less	Increase surveillance localize area	1. Aerial Search 2. Ground Patrol 3. Notify Authorit 4. Alert repair & cleanup crews
Public	Minor leak or spill	Reduce system pressure or shutdown system,close block valves verify if All American Leak	1. Dispatch repair & cleanup crew 2. notify Authorit
Leak Detection System	Major Leak or spill ( ) BBL/MIN or greater	Shut Down system, close block valves	1. Aerial Search 2. Ground Patrol 3. Notify Authorit 4. Alert repair & cleanup crews

RESPONSE TO LETTER 69

69-11 Please refer to the response to Comment 69-8.

69-11 Cont.

NOTIFICATION BY	INDICATION	SUPERVISORY RESPONSE	FIELD RESPONSE
Public	Major leak or spill	verify if All American Leak Shut Down System, close Block valves	1. Dispatch repair & cleanup crews 2. Notify Authority
SCADA System or public	Pump Station spill, fire or damage	Shut down and bypass station, shutoff fuel gas	1. Dispatch repair & cleanup crews 2. Notify Authority

LETTER 69

4. STATION AND TERMINAL LEAKS OR SPILLS

69-12 (Spill Prevention Control and Countermeasure Plan)
The possibility of leaks or spills at pumping/heater stations and pipeline terminals has not been addresed in the DSEIS.

There exist possibilities of oil leaks and spills due to pipe, valve, equipment and control failures and leakage or overflow from sump tanks, relief and storage tanks, main and auxiliary pumps and direct fired crude oil heaters.

69-13 Since the stations are designed for operation on an unattended basis, leaks or spills which might be intercepted if these sites were attended may extend beyond the limits of station or terminal sites.
The design of the surface drainage systems at these sites should provide for curbing, dikes, drain ditches and provision for containment of oil spills or leaks by means of sumps. oil recovery pumps, oil water skimmers, and retention ponds for storm water.
The station piping and equipment may contain a considerable volume of oil which way escape in the event of a failure or during equipment maintenance.

It is suggested that while the station and terminal sites may not come under the jurisdiction of Title 40 CFR Part 112, Oil Pollution Prevention, which incorporates the Environmental

RESPONSE TO LETTER 69

69-12 The historical statistics shown in Figure 4-1 of the Draft SEIS show that tank farm and pumping station spills are a very small fraction of the total number of oil spills from a pipeline transportation system. Using the pipeline statistics gives a reasonable estimate of the total number of spills expected from this project. Please refer to the Modifications and Corrections section for page B-15 for a discussion of emergency response procedures.

69-13 Please refer to the response to Comment 69-1.

LETTER 69

Protection Agency regulations for the prevention of pollution of waters of the United States by oil emanating from non-

69-14 transportation related onshore and offshore facilities, that these regulations be used as the basis for the preparation of site specific spill prevention control and countermeasure plans.

69-15 Suggested proceedures for development of SPCC plans is presented in American Petroleum Institute API Bulletin D-16 entitled " Suggested Proceedures for Development of SPCC Plans"

RESPONSE TO LETTER 69

69-14 Please refer to Modifications and Corrections section for page 1-3.

69-15 Table 2-6 listing applicable regulatory standards and codes has been revised to include this document. Please see Modifications and Corrections Section 3.2.

ITEM 5. FIRE PROTECTION AT PUMP/HEATER STATIONS

The DSEIS addresses the matter of fire protection at pump/heater stations in an inadequate manner.

The pump/heater stations are proposed to be operated in an unattended manner by remote supervisory control. Fire protection is proposed to be provided by the following systems:

Smoke detectors

Fire Sensors

Portable fire extinguishers

69-16 The portable fire extinguishers are for extinguishment of very small fires in the event personnel are at the station when fire breaks out. (Reference Section 5.0 Fire Protection Plan)

Since it is proposed to have personnel visit the station briefly once in 24 hours, the system should be properly described as a fire detection system.

Lacking a fire protection system at the pump/heater stations, the probable result of a fire or explosion at a pump/heater station would be the partial or complete destruction of the station and the possibility of the release of oil spills or burning oil beyond the station limits.

69-17 Table 3-27, page 3-95 provides a tabulation of municipal fire departments within proximity of pump/heater stations an analysis of the proximity of municipal fire departments to pump/heater stations for the proposed and alternate routes

69-16 Additional data on responding to a pump/heater station fire is given in the Modifications and Corrections section for page 4-5. Also, please refer to Mitigation Measure SS-9 (in Appendix A).

69-17 Please refer to the response to Comment 69-16.

is as follows:

PROPOSED ROUTE

For the proposed route, six fire departments are deemed to be within proximity of the pump/heater stations as follows:

STATION NUMBER	DISTANCE TO NEAREST STATION	NAME OF TOWN
1	50 Miles	ODESSA
2	65 miles	SAN ANGELO
3	20 Miles	FREDRICKSBURG
4	10 Miles	LOCKHART (v)
5	35 Miles	ROSENBERG (v)

69-17 Cont.

NORTHERN ALTERNATE

For the Northern alternate, six fire stations are deemed to be within proximity of the pump/heater stations as follows:

STATION NUMBER	DISTANCE TO NEAREST STATION	NAME OF TOWN
!	50 MILES	ODESSA
2	40 MILES	SAN ANGELO
3	35 MILES	BROWNWOOD
4	50 MILES	BROWNWOOD
5	25 MILES	TEMPLE
6	35 MILES	ROSENBERG

SOUTHERN ALTERNATE

For the Southern Alternate Six Fire Departments are deemed to be within proximity of the pump/heater stations as follows:

STATION NUMBER	DISTANCE TO NEAREST STATION	NAME OF TOWN
1	50 MILES	ODESSA
2	75 MILES	SAN ANGELO
3	120 MILES	SAN ANTONIO
4	45 MILES	SAN ANTONIO
5	35 MILES	SEGUIN (v)
6	10 MILES	EL CAMPO (v)

(v) The majority of personnel in fire department are volunteers

69-17 Cont.

A number of the fire departments listed are small and have a high percentage of volunteer firemen. In many locations the pump/heater station is not located in the same community or county as the nearest fire department and no indication has been given in the DSEIS whether there have been any discussion or agreements with any of the fire departments listed for providing assistance in the case of fire or accident at pump/heater station sites, or agreement for participation in training programs or fire drills.
It is also not clear is the DSEIS whether the policy of ALL American pipeline would permit municipal fire departments to enter the pump/heater station sites in an emergency. It is the policy of many companies in the pipeline and refinery or petrochemical facilities not to permit municipal fire companies to enter their properties because of possible liabilities.

69-17 Cont. In the absence of fire fighting facilities beyond portable extinguishers what, if anything could be done by a municipal fire company lacking water supplies, chemicals, foam and a hydrant system necessary to fight a oil or gas fueled fire.

69-18 The risk of fire and explosion at a pump/heater station on a remotely operated unattended pump/heater station is considerably greater than at a conventional electric powered crude oil pumping station operating at ambient temperatures, because of the operation of the 30,000,000 BTU direct fired crude oil heaters. The higher temperature of the crude oil means higher volatility of the vapors which would be released in the case of a leak or spill and easier ignition of the crude oil and vapors in case of fire or explosion.
The statement in 4.2.1.2.1., Pipeline Design in the DSEIS that All Americans pipeline design for control systems for pump/heater stations are consistent with unmanned pumping stations throughout the industry is misleading since most crude oil truck lines in the United States operate with crude oil at ambient temperatures and do not include direct fired heaters.

69-19 The All American pipeline may transport various types of crude oil during its operational life. From the data supplied in the DSEIS some of the crudes that may be transported have light gasoline components to 20.5 percent and API Gravities of 38.6. When heater to 160^{0}F these

69-18 Please refer to the response to Comment 69-2.

69-19 The intention of AAPL is to only heat crudes to the extent necessary to sufficiently decrease the viscosity for crude oil shipment through the pipe. Crudes with extensive quantities of lighter gasoline components will not require heating to 160°F as suggested by the comment.

69-19 Cont. will vaporize and the possibility of ignition of crude oil and vapors is significant rather than unlikely as stated in the DSEIS.

69-20 The Oil Insurance Association in their publication # 501 entitled "Fired Heaters" states that in a typical year 16 percent of the fires reported in the petroleum industry originate in heaters. While direct heaters for pipeline crude oil heating operate at lower temperatures than refinery or gasoline plant heaters, they do significantly increase the risk of oil spills, fire and explosion. As a minimum systems safety measure an automatic fire extinguishing system should be provided at each pump/heater station control building to protect the supervisory control and data acquisition (SCADA) system and the communications system and the switchboard and control circuits controlling the operation of the main pumps, block valves and gas supply to the direct fired heaters. An emergency power supply should be provided to insure the ability to maintain remote supervision and control and to shut down the station in the event of an explosion or fire.

69-21 The electrical switchgear, control building, pumps and heaters should be separated sufficiently so that an explosion or fire at the heaters will not spread to the main pumps or to the control buildings and switchgear.

69-20 The pump/heater station automatically closes valves to the crude oil and natural gas supply upon detection of a fire by the sensors.

69-21 The layout of the pump/heater stations is required to comply with all fire protection codes and standards.

LETTER 69

p-16

69-22 The control building should be protected against the entrance of oil spills, gases or vapors.

69-23 The storm water drains should be so designed as to contain oil drainage, leaks or spills within the station site by use of dikes, ditches, oil-water separators, skimming or retention ponds, and a separate oil drain and oil

69-24 collection and recovery system. Consideration should be given to the installation of oil spill monitoring instrumentation at all station or terminal sites.

69-25 Materials for contruction of temporary dams, sorbents and other provisions for containment of oil spills should be provided at each station for use by emergency crews.

RESPONSE TO LETTER 69

69-22 The pump station control building design proposed by AAPL indicates it will be raised off the ground and sealed to provide a controlled environment for the equipment inside. This should prevent the entrance of oil spills, gases, or vapors.

69-23 Please refer to the response to Comment 69-1 for a discussion of the issue of oil spill drains, dikes, etc. at the proposed pump/heater stations.

69-24 The proposed pipeline leak detection system is capable of detecting the presence of a leak or spill at any of the pump/heater stations. Leaks at terminal sites prior to the delivery point will also be detected by the leak detection system. After the delivery point, leak detection is the responsibility of the terminal operator and are covered under the terminal's spill response procedures.

69-25 Provisions for storage of spill response equipment and materials at locations near areas sensitive to oil spills was considered but rejected because of the likelihood that such material would degrade over time and not be suitable for response actions in the event of an emergency.

ITEM 6 EXTERNAL PIPE COATING SYSTEM

69-26 There is a discrepancy in the description of the proposed coating system for the 30 inch pipeline in the DSEIS. Section 2.2.2.6 describes the use of 20 mil vinyl tape, Section 4.2.1.2.1. describes the use of double wrapped polyethylene tape. Extruded plastic coating or equivalent

69-27 has been incorporated as a corrosion mitigation measure in environmentally sensitive areas. Thickness or characteristics for either the polyethylene tape coating or extruded coating are not given.
Both vinyl and polyethylene are thermoplastic materials. As temperature increases both the tape materials and the adhesives generally used will soften. Pipe movement in the trench and associated soil stress may accelerate disbonding and deterioration. Proper evaluation of the proposed coating system as applied to heated oil pipelines must be made as the replacement of a failed coating system is an expensive and hazardous undertaking.

69-28 The use of an extruded or equvalent coating system as recommended in Safety measure SS-7 with compatible field jointing materials to provide corrision protection is an improvement however there is no valid reason why the most effective system available should not be used for the entire pipeline. We recommend that System Safety measure include the entire pipeline. The coating system

69-29 to be extruded plastic or equivalent fusion bonded coating with field joints applied in accordance with the

69-26 The terminology in the Draft SEIS has been clarified. Please see the Modifications and Corrections section for pages 2-23 and 4-4.

69-27 The review of the design data indicates the coating can withstand temperature stresses up to 180°F.

69-28 The suggestion that Mitigation Measure SS-7 be expanded to cover the entire pipeline is noted. The application of any mitigation measure is by definition restricted to those areas along the pipeline route where significant environmental impacts are reasonably expected to occur.

69-29 As noted in the response to Comment 69-15, Table 2-6 has been modified to include this reference.

69-29 Cont.

manufacturers recommendations, the NACE RP-01-69 Recommended Prqctice " Criteria for Cathodic Protection" and the National Association of Pipe Coating Applicators Specification and Plant Coating Guide.

ITEM 7 CATHODIC PROTECTION

69-30 Since external corrosion is the principal statistical cause of pipeline leaks or spills, properly designed and applied coating systems and cathodic protection systems are essential. The SDEIS is unclear on what is proposed to be provided for cathodic protection.
In section 4.2.1.2.1. (Pipeline Design) the DSEIS states that All American intends to provide cathodic protection by hooking into the existing corrosion protection systems of other pipelines crossed by their 30 inch pipeline.
This proceedure does not provide protection to entire 30 inch line but only assists in preventing localized corrosion until a permanent cathodic protection system is in place and operating.
The permanent protection system is frequently made operational after the trench backfill has stabilized. At critical locations such as river and stream crossings, the installation of sacrificial anodes to provide temporary protection until the permanent protection system is in place and operating should be recommended as a System Safety measure.

69-31 Primary cathodic protection for the pipeline system is proposed to be furnished by electric rectifiers connected to deep ground beds. Since it is proposed to locate the rectifiers and ground beds at pump/heater and terminal station sites, the ground beds and wells are vulnerable to contamination from leaks and spills at these locations.

69-30 The use of sacrificial anodes in the temporary cathodic protection system as recommended in the comment is included in the project design proposed by AAPL.

69-31 The All American Pipeline design includes protection for deep-well groundbeds. Please refer to the Modifications and Corrections section for page 2-7.

69-31 Cont. The deep ground bed wells should be properly sealed at the surface to prevent contamination of groundwater supplies at the station. This should be addressed in site specific contingency plans for all pump/heater stations and terminals regardless of whether the proposed pipeline route or alternate route is selected by BLM.

LETTER 69

ITEM 8 INTERNAL PIPELINE CORROCION

Internal pipeline corrosion is not considered to be significant in the DSEIS. It is planned, however, to transport high sulfur crudes such as Santa Barbara Crude. It is not possible to predict with any degree or certainty what mix of crude oils will be transported in the All American pipeline in the years to come, or who the owner or operator of the pipeline system will be.

69-32 Some components of crude oil may be corrosive to steel in the presence of small amounts of water, either produced with the oil or entering the crude stream between the production facilities and initial pipeline injection station. Unless rigorous methods are used to prevent the entrance of water and the pipeline is dehydrated properly after hydrostatic testing, traces of water will remain or be carried into the pipeline system during operations.

69-33 Chemical corrosion inhibitors are available to mitigate and control internal corrosion. These may be injected into the pipeline at a ratio proportional to flow. The dosage may be determined by examination of test coupons installed in the main pipeline at various points. If these test coupons indicate that internal corrosion is occuring, the corrosion inhibitor dosage can be increased or other

RESPONSE TO LETTER 69

69-32 Please refer to the Modifications and Corrections section for page 4-4 for additional information on the testing for corrosive substances in the crude oil and the restrictions on their transport.

69-33 The suggestion to require chemical corrosion inhibitors is noted. The application of such a mitigation measure lies outside the jurisdiction of the BLM because it relates to pipeline operational practices rather than to pipeline design and/or construction. BLM as the authorizing agency for the ROW grant has no procedure for enforcing operational practices as mitigation measures. Agencies such as the DOT, which do have jurisdiction over interstate pipeline operations, may require such measures at their discretion.

69-33 Cont. preventative measures taken as required.

It is recommended that the SEIS include a system Safety and Reliability Measure in Section 4.7.1 requiring that All American install facilities and equipment for storage and injection of pipeline internal corrosion inhibitors and install corrosion test coupon holders and test coupons at the Pump/heater stations and terminals on the proposed All American 30 inch pipeline for either the proposed or alternate routes. 69-34

It is recommended in addition, that the SEIS include a System safety and reliability measure requiring that All American pipeline is capable of accomodating instrumented pigs for internal non destructive inspection of internal and external pipeline condition.

RESPONSE TO LETTER 69

69-34 The design information submitted by AAPL indicates the pipeline is capable of accommodating equipment such as instrumented pigs, test coupons, etc. Equipment which is not specifically included in the pipeline design can be easily retrofitted to the system in the event such use is required in the future. In the case of instrumented pigs, these can be used with the present design by manually by-passing the pump stations along the pipeline route.

ITEM 9 APPLICABLE CODES AND STANDARDS

69-35 The following standards or codes should be added to the tabulation of applicable codes and standards, Table 2-6 Texas Railroad Commission, Gas Utilities Division, Hazardous Pipeline Safety Rules, Docket 4549.
These incorporate by reference, the Fedeal Pipeline Safety Code and include additional requirements specific to pipelines within the State of Texas which must be taken into account.
NATIONAL ASSOCIATION OF CORROSION ENGINEERS, Criteria for Cathodic Protection NACE RP-01-69 This code is specifically referenced in Texas RRC Docket 4549 which specifies that Cathodic Protection systems must meet or exceed the minimum criteria set forth in NACE RP-01-69.

AMERICAN PETROLEUM INSTITUTE Specification for Line Pipe API-5-L

CODE OF FEDERAL REGULATIONS Title 40 Part 112, Environmental Protection Agency, Oil Pollution Prevention
The administration of transportation related onshore facilities has been assigned to DOT by EPA by means of an interagency memorandum of understanding, however this title is useful as a guide to providing protection against spills at pump/heater station and terminal facilities on the pipeline.

69-35 Please refer to the response to Comment 69-15.

69-35 Cont.

AMERICAN PETROLEUM INSTITUTE, API Bulletin D-16

Suggested Proceedures for Development of Spill Control and Countermeasure Plans

This publication was issued to assist in the development of SPCC plans which conform to the requirements of Title 40 Part 112, EPA, Oil Pollution Prevention and may be used as a guide to preparation of site specific SPCC plans for All American Pump/Heater and terminal stations for inclusion in the SEIS and for use by All American Pipeline Company.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) 70

National Electrical Code

Prescribes minimum standards of design and construction of power, lighting control and communication equipment wiring and installation in hazardous and non-hazardous locations .

ITEM 10 SPECIAL CONDITIONS

69-36 In section 2.2.2.11.2. Water Crossings, the description of major water crossings does not set forth the pipe wall thickness to be used for either the proposed or alternate routes. The minimum pipe thickness at water crossings should be 0.500 inches, the same as proposed in section 2.2.2.11.3. Aquifer Crossings. In addition, the use of extruded polyethylene, fusion bonded or equivalent coatings, outerwraps and concrete jacketing should be used to provide protection against physical damage and corrosion. The requirements for all areas where increased exposure to environmental damage and pollution of water supplies is high should be the same with respect to pipe wall thickness and grade, cathodic protection, pipeline markers, leak monitoring, frequency of patrols and record keeping requirements whether the proposed or alternate routes are selected by BLM.

69-36 The pipeline design proposed by AAPL does include a pipe thickness of 0.500 inches for all major water crossings. The use of appropriate coatings has been included in Mitigation Measure SS-7 in Appendix A in order to protect water crossings which are particularly sensitive to oil spills.

69-37 Instead of having many diffent agencies responsible for reviewing pipeline design and construction, testing, inspection and commissioning and review and approvals of proposed operating and emergency proceedures, It is recommended that agreements be entered into between all agencies

69-37 Part 1. Compliance review for mitigation measures and other design criteria beyond DOT regulations will be enforced by the BLM Authorized Officer. DOT will regulate this project as it does all interstate common carriers, and the TRRC will issue operating permits. The DOT takes precedence over the TRRC on interstate pipeline projects. Refer to comment 6-15 for TRRC jurisdiction.

Part 2. Oversight inspections of the design and construction of the All American Pipeline are provided for in Mitigation Measure SS-3 (in Appendix A). The BLM will be the oversight agency for the proposed All American Pipeline. The BLM has both the qualified personnel and the experience to conduct such oversight and is currently performing such functions on the California to Texas segment of the All American Pipeline. The BLM will coordinate this review and oversight with other agencies which have jurisdiction over the pipeline so as not to duplicate such efforts.

and authorities involved such as the BLM, The Texas Railroad Commission, The Texas Water Board, the water districts, and other federal and state agencies to nominate a single agency to furnish sufficient qualified technical, inspection and clerical personnel on a timely basis to review and supervise the design, construction plans, field construction, testing and compliance with the Final Supplemental Environmental Impact Statement and Federal, State and Local codes and standards.

The cost of providing this inspection and oversight to insure compliance would be borne by All American Pipeline. The agency recommended to provide these services using either in house and/or contractors is the Texas Railroad Commission who have the expertise to supervise the project. This would simplify the management of the project since the responsibility for insuring compliance would be under the direction of the Texas Railroad Commission which has the legal responsibility for administering Title 49 CFR Part 191 and RRC Docket 4549.

69-37 Cont.

The use of a single oversight agency instead of several individual quality control inspectors such as proposed in section 2.2.2.11.3 for the Edwards Aquifer or Ellenburger Aquifer would eliminate the problem of conflicting decisions and the possibility that other governmental agencies or authorities may insist on requiring their own quality control inspectors in areas impacted by the pipeline.

69-37 Cont.

It is recommended that Measure SS-3 Section 4.7.1. Independent analysis and review be provided by the Texas Railroad Commission, if agreeable to the commission, using in house and/or contract personnel to comply with the intent of this measure on a timely basis.

Since the greatest possibilities of leaks and spills at pumping/heater stations and terminals, aquifers , and major river and stream crossings either on the proposed or alternate routes it is recommended that independent inspection and oversight be provided at these locations as a minimum and that the cost of providing such services be borne by All American Pipeline Company, and, that all parties agree in advance to accept the decisions of the independent inspection and oversight agency as final and binding if the above recommendation is incorporated in the final SEIS by BLM.

LETTER 69

ITEM 11 BLOCK VALVES

69-38 We concur with measure SS-2 Section 4.7.1 System Safety and Reliability, to provide remote control motor operated block valves. These valves should be installed regardless of whether the proposed route or alternate routes are selected by BLM at all block valve locations as well as at aquifer crossings and at major river and stream crossings. The most important factor in limiting the amount of a spill or leak is the ability to rapidly stop pumping and close the main line block valves. There does not appear to be much advantage in installing a state of the art leak detection system capable of detection of a leak in 10 seconds if it takes up to four hours to reach a valve for closure. Providing electric motor operators will not significantly reduce the ability to prevent line draindown from a line break or leak. The same conditions which may

69-39 wash out a river or stream crossing may make access to a block valve difficult. It is important that redundancy be provided in the remote control valve communications and control system as far as practical. The block valve site and its power supply and communications facility must be located so as to minimize damage by the same incident that may have caused the spill.

69-40 We recommend that measure SS-5, Section 4.7.1, be deleted and that Measure SS-2 be amended to include all main line block valves between McCamey and Webster/Texas City whether

RESPONSE TO LETTER 69

69-38 Thank you for your comment regarding block valves. Please refer to the revised Mitigation Measure SS-5 (in Appendix A). The requirement for motor-operated valves has been replaced with a requirement for placement of air or electric impact wrenches on all pipeline service vehicles. This is believed to provide equivalent protection to the original mitigation measure for motor-operated valves. Mitigation Measure SS-2 provides for remote-control valves at sensitive water crossings.

69-39 Mitigation Measures SS-6 provides for a backup communications system (see Appendix A).

69-40 The requirement for remote-control block valves has been specified for valves where the estimated closure time exceeds one hour and the area is particularly sensitive to an oil spill. Please refer to Mitigation Measure SS-2 (in Appendix A) for a discussion of which areas require remote-control block valves.

the proposed route or an alternate route is selected by BLM.

The reasons for providing for remote control and motor actuation for all block valves on the 30 inch pipeline are as follows:

At night or during inclement weather it may be impossible to determine which block valve closure is required to stop line draindown through a leak or spill detected by the spill detection system or by more conventional methods. The ability to stop all pumping operations and close all valves will reduce leaks or spills to a minimum while the exact location of the line break or leak is found. This will substantially reduce the anticipated catastrophic spill volumes.

69-40 Cont.

The incremental cost of providing remote control to motor operated block valves will be nominal if measure SS-5 is part of the final requirement of the SEIS. If the provisions of SS-6 is also incorporated in the final SEIS both the normal and backup communication systems can be used for remote control of all pipeline block valves regardless of final route selection by BLM

Motor operated block valves without provision for remote control offer little or no reduction in the volume of spills since the main cause of atastrophic spills is the drain down of the pipeline by gravity through a

LETTER 69

69-40 Cont. line break from the time of occurance until the pumping/ heater stations are shut down and the appropriate main line block valve is closed.

69-41 In appendix A of the DSEIS it is assumed that All American has a 2.0 minute pipeline shutdown and that manual pipeline valve closure occurs in sevety two minutes. This may be very optimistic if the maintenance crew is based in Austin, the line break occurs after dark or during inclement weather and the travel time to the assumed location of the nearest block valve to the break is 150 or more miles from Austin or McCamey . If a line break occurs between stations it may be difficult to determine from the available data where the break is located and since there may be as many as four block valves between stations, the time to find and close the correct valve may be much greater than the four hours estimated in the DSEIS.

RESPONSE TO LETTER 69

69-41 The 72-minute valve closure time cited in the Draft SEIS was intended for use in calculating the estimated average spill size. For specific receptors which are sensitive to an oil spill, actual estimates of valve closure time were made given the location of the spill and the nearest maintenance center. These valve closure times are listed in the Draft SEIS Tables 4-9, 4-39, and 4-51 and represent the best available estimate of valve closure times. Where valve closure times were deemed inadequate for resource protection, Mitigation Measure SS-2 in Appendix A has specified remote-control valves.

ITEM 12 HYDROSTATIC TESTING

69-42 We concur with the requirements in the DSEIS for hydrostatically testing the pipeline for a minimum of 24 hours. Testing proceedures should conform in so far as practical to American Petroleun Institute Recommended Practice for Pressure Testing of Liquid Petroleum Pipelines, RP-1110.

69-43 The agency and/or individuals responsible for independent oversight and inspection of the construction of the pipeline should be notified in advance of testing and all tests shall be witnessed and signed off by representatives of the contractor, All American Pipeline and the oversight and inspection agency.

69-44 In addition to the pipeline hydrostatic tests, the piping at pump/heater stations and terminals should be tested in accordance with Part 195 Title 49, Subpart E and USAS B 31.4. Duration of these tests should not be less than 24 hours the proceedures required for testing the main pipeline should apply.

69-42 Thank you for commenting. The referenced document will be cited as noted in the response to Comment 69-15.

69-43 The BLM as the authorizing agency for the Record of Decision will be present to witness the hydrostatic testing of the pipeline. Please refer to Section 1.3 of the Draft SEIS for details on the BLM's jurisdiction and enforcement responsibilities during pipeline construction.

69-44 The procedures for testing the piping and pump/heater stations will be conducted as described by the comment.

ITEM 13 NON DESTRUCTIVE TESTING OF WELDING

69-45 It is recommended that 100 percent radiographic inspection of girth welds of the main pipeline, pump/heater station and terminal piping except non-pressure piping, be required regardless of whether the proposed or alternate routes are selected by BLM. This would include cross country locations as well as road and railroad crossings, river and stream crossings and crossing of aquifer recharge zones. The stresses imposed on heated oil pipelines caused by thermal expansion and contraction are greater than those experienced by pipelines which operate at ambient temperaturs. These stresses can cause early weld failure if defective welding is present. 100percent radiographic inspection of girth welds will detect poor welds and permit their repair.

Film used for radiographic inspection should be properly identified and shall be available for review by the representatives of the oversight agency. All American shall be required to maintain permanent records of the qualifications of all weldors on the project and inspection records. Only qualified weldors shall be used on the project. Separate qualifications shall be required for pipeline weldors and pump/heater station and terminal weldors.

69-45 Mitigation Measure SS-8 has been included to require 100 percent inspection of pipeline welds in areas deemed by the Authorized Officer to be sensitive to an oil spill. AAPL is required by DOT to maintain film for subsequent inspection by regulatory representatives. Welders must be qualified following DOT specifications as provided in 49 CFR Part 195.

ITEM 14 CLEANUP AND RESTORATION

69-46 Table 2-7 of the DSEIS indicates that approximately 335 people will be required to man each construction spread. In section 2.2.2.10 the estimated amount of solid waste generated is 100 to 200 pounds per day, this probably is low and does not include scrap pipe, pipe coating materials, material packaging, used lubricating oils, oil and air filters or stub ends of welding rods or empty welding wire reels etc. Some of this waste would be environmentally hazardous or damaging if not properly disposed of. In addition to the above waste there will be human waste from the estimated 335 people working on each spread, an amount equal or exceeding that generated in some of the towns in the vicinity of the pipeline. As noted in section 2.2.2.11.1, at special construction locations such as highway, railroad or foreign pipeline crossings smaller construction crews will be required but comparable generation of solid, liquid and human waste will occur. At major river crossings as noted in section 2.2.2.11.2 construction will require a crew of approximately 50 people and at pumping station sites as stated in section 2.2.3 20 to 25 men crews will be required for up to six months.

69-46 The Authorized Officer will conduct general reviews of construction practices to ensure local, state, and federal laws and regulations are not violated relative to soil and water contamination. Local laws generally control solid waste disposal, however, state and federal laws impose regulations on surface and groundwater contamination. Hazardous wastes of this kind (e.g., used oil, paint) are enforced under RCRA small generator regulations.

LETTER 69

In order to protect against environmental damage and pollution during construction it is proposed that the following measures be included in section 4.7.1., System Safety and Reliability, 4.7.2. Groundwater and section 4.7.3 Surface water:

Measure 1: Require that contractor furnish and use adequate leakproof containers for collection , retention and hauling of non hazardous rubbish, trash and garbage to environmentally acceptable burial or disposal sites.

69-46 Cont. Measure 2: Require that contractor furnish and use adequate leakproof containers for collection, retention and hauling hazardous rubbish, trash and used containers including used oil filters, air cleaners, used oil cans, oily rags, chemicals and anti freeze, paint, primers etc. for disposal at acceptable facilities for this class of waste.

Measure 3: Require that contractor furnish adequate portable toilet facilities for personnel at work sites and provide for disposal of human wastes at approved sewage disposal facilities.

69-47 Measure 4. Require that contractors furnish all mobile fueling and lubrication equipment with emergency oil sorbent materials and necessary tools to contain

RESPONSE TO LETTER 69

69-47 The Modifications and Corrections section for page 4-8 discusses construction fuel spills. Mitigation Measure AB-1 in Appendix A requires that fueling and other activities be conducted away from surface waters. This, plus prompt cleanup should prevent construction-related spills from reaching environmentally sensitive areas. The measures suggested by the comment far exceed standard industry practice.

69-47 Cont.

fuel spills and/or lubricating oil spills and that written proceedures for spill containment and control be prepared by All American to insure that proper proceedures for fueling, lubrication oil changes and containment and cleanup of spills of fuel, oil lubricants and hydraulic oils are followed by pipeline and pump station construction personnel.

Measure 5: Require that drums or portable tanks used for storage of fuel, lubricants or hydraulic oils be handled with suitable equipment and be stored on proper supports or cradles and be equipped with adequate shut off valves, and that dikes or other means of spill retention be provided at all locations where drums or tanks are used or stored.

ITEM 15 PROPOSED RULEMAKING, U.S. DEPARTMENT OF TRANSPORTATION

69-48 The DOT Department of Pipeline Safety has asked for comments by March 30, 1987 on whether increased regulation of natural gas and hazardous liquid pipelines is required and has listed a number of issues which have been raised at state and local levels. Some of these are as follows:

1. Operators would be required to provide local fire departments and public safety agencies maps of pipelines and descriptions of transported substances.
2. Pipelines would be required to notify landowners within one half mile of pipelines of the location of the lines and how to identify and respond to hazards.
3. Operators would have to post signs where pipelines cross roads.
4. Companies would be required to convert shutoff valves on existing lines to work automatically and build new lines with shutoff valves every 20 miles in rural areas and every 4 miles in urban areas.
5. Operators would have to submit inventories of pipelines in their systems including line specifications to the Office of Pipeline Safety, DOT.
6. Operators would be required to conduct integrity testing every 2 to 3 years and use smart pigs to detect flaws.

69-48 The comment recommending impact mitigation along the lines of the potential future federal rulemaking on hazardous liquid pipelines is noted. The Final SEIS has considered various mitigation measures for the pipeline based on several factors, including the significance of the expected impact, the resources affected, and the availability and effectiveness of mitigation. Consideration of potential mitigation strategies has been extensive. However, until the rule changes referenced by the comment have undergone public and industry review as required, their inclusion as mitigation measures for the SEIS would be premature. Should any of these proposed rule changes become law, those that affect the All American Pipeline would be enforced by the appropriate federal agency, most likely the DOT.

7. Companies would be prohibited from laying new pipelines within 150 feet of any permanently inhabited facility.

8. Pipeline companies would have to cathodically protect and coat hazardous product pipelines to prevent corrosion.

9. Companies would be required to build new lines in populated areas or convert existing lines with double wall construction and continuous leak detection systems.

10. Operators would be required to improve their ability to rapidly locate and isolate leaks through use of remote controlled valves, remotely monitored gauges and more specific emergency proceedures.

11. The federal government would become more involved in design and construction of new lines or certification of design and construction personnel.

69-48 Cont.

Some of the proposed rules may be adopted. Of principal interest with respect to the All American Pipeline project is proposal 4 and 10 involving use of automatically operated or remote controlled block valves and location of block valves proposal 6 which would require integrity testing and proposal 9 which would require double wall construction and continuous leak detection systems.

The proposed DOT rules should be considered by BLM in the preparation of the final SEIS for the All American Pipeline Project.

LETTER 70

City of Austin

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March 25, 1987

William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Re: All American Pipeline
Draft Supplemental Environmental Impact Statement

Dear Mr. Haigh:

70-1 My review of the above-referenced SEIS as well as other documentation regarding All American Pipeline's proposed McCamey to Freeport crude oil pipeline leads me to endorse the Northern Alternative. Requiring the pipeline to follow the northern route is in the best interest not only of the City of Austin, but of all Central Texans who utilize groundwater from sensitive aquifers for recreation or drinking water supply. As the SEIS states, all alternatives have their drawbacks but the potential problems associated with the Northern Alternative can be more easily mitigated. Risk benefit analysis clearly favors the Northern Alternative.

Attached as Exhibit "A" please find the comments of the City's Department of Environmental Protection. Their analysis bolsters my endorsement of the Northern Alternative. I am so convinced of the superiority of the Northern Alternative that if it is not ultimately selected by the Bureau of Land Management as the best route, I intend to request City Council authority to join the Counties of Travis, Hays and Gillespie and the City of New Braunfels in any legal actions necessary to require the pipeline to follow the northern route

Thank you for this opportunity to comment.

Sincerely,

Barney L. Knight
City Attorney

BLK:MIC/er
Haigh MIC

RESPONSE TO LETTER 70

70-1 Your comment regarding support for the Northern Alternative is noted.

cc: Edward Hastey
California State Director,
Bureau of Land Management

Ron Hinn, President
All American Pipeline Company

Mac Hoffman
Celeron Pipeline Company

LETTER 70

MEMORANDUM

TO: Barney Knight, City Attorney
Legal Department

FROM: Austan S. Librach, Director
Department of Environmental Protection

DATE: March 3, 1987

SUBJECT: All-American Pipeline Draft SEIS

The Department of Environmental Protection has reviewed the Draft Supplemental Environmental Impact Statement (DSEIS) prepared for the Bureau of Land Management (BLM) for the proposed All-American Pipeline Project from McCamey, Texas to Webster and Texas City, Texas. Our review and comments have emphasized the comparative environmental risks of the proposed route and the alternatives, particularly with respect to highly sensitive environmental resources, and identification of major factors to justify our recommendation. Our justifications are based primarily on the analysis presented in the DSEIS itself, so as to make our case to the BLM supportable from their own perspective. Please feel free to incorporate these comments as appropriate into a single statement representing the City's position on the DSEIS.

It is apparent from the EIS Scoping Process document prepared on behalf of the Counties of Travis, Hays, and Gillespie, and the City of New Braunfels, that these entities have assembled a group of experts with ample qualifications to scrutinize every aspect of the DSEIS that is of concern to the City. In addition to characterization of the sensitive environments potentially affected by the project, the critical aspects of environmental risk determination involve evaluation of pipeline integrity, potential spill frequency and volumes, leak detection technology, and the effectiveness of contingency plans. We have not conducted a detailed analysis of pipeline technology or oil spill risk issues. While our staff does not have expertise in these areas, the team assembled by Travis County, et. al. includes several experts in pipeline technology. There is a particular need to evaluate the adequacy of the spill frequency and average spill volumes predicted for the Edwards aquifer recharge zone. The risk reduction factors applied to this stretch of the pipeline appear to be rather liberal. 70-2

Recommendations

Based on the analysis presented in the DSEIS, as well as our own analysis of the sensitive resources potentially affected by the project, we strongly recommend the rejection of the proposed route and adoption of the northern

EXHIBIT "A"

RESPONSE TO LETTER 70

70-2 The spill frequency and volume estimates were made using the best available information. Please refer to Modifications and Corrections section for page 4-10 for additional data on spill frequency and volume calculations.

LETTER 70

alternative, which is the BLM's preferred alternative. Our reasons for this recommendation are summarized below.

70-3 1. Based on the comparative analyses presented in the DSEIS, we believe it would not be possible to provide an equivalent level of environmental risk for the proposed route as compared to the northern alternative. Due to the physical and hydrological characteristics of the Edwards Balcones Fault Zone aquifer (Edwards aquifer), the potential for significant adverse impacts on an important public water supply would always be greater with the proposed route than the northern alternative. Even though measures have been proposed to lower the probability and magnitude of a spill over the Edwards aquifer recharge zone relative to other areas traversed by the pipeline, the potential exists for a significant spill to allow contaminants to enter the aquifer and cause significant adverse impacts. In addition, contamination of the unsaturated zone above the aquifer could provide a chronic source of pollution. Since the Edwards aquifer and the karstic Edwards Limestone is also a unique ecosystem, providing habitat for several federally listed and special status species, the risk of adverse impacts on sensitive ecological resources is also inherently greater for the proposed route than the northern alternative (see No. 7 below).

70-4 2. Although the northern alternative entails potential impacts on public water supplies, the primary difference between it and the proposed route is that with the northern alternative these water supplies are in surface water bodies. The likelihood of successful clean-up of an oil spill, with no significant adverse impact on a water supply, is many times greater for a surface water body than for a karstic groundwater body such as the Edwards aquifer. The same measures proposed to reduce the likelihood and severity of an oil spill in the Edwards aquifer area could be employed at stream crossings upstream of water-supply reservoirs.

70-5 3. Although both routes traverse the outcrop (recharge) zones of sensitive aquifers, it is apparent from Table 3-1 of the DSEIS that the northern alternative traverses significantly less distance than the proposed route (335 miles versus 401 miles). This indicates a lower level of environmental risk for all aquifers of concern by adoption of the northern alternative. The proposed route is the only alternative route which traverses the Edwards Balcones Fault Zone aquifer, the most sensitive of all these aquifers of concern.

70-6 4. In addition to the risk of a rupture-related oil spill, which is addressed in the DSEIS, we believe that a significant impact to the Edwards aquifer could occur over a long period of time as a result of low-volume, chronic leaking, particularly if the escaping material moves down through the karstic limestone with no surface exposure. The DSEIS does not adequately address potential impacts resulting from low-volume undetected leaks over the life of the project. The probability of detecting such low-volume leaks would be much greater for an affected surface water body, such as the water resources of primary concern with the northern alternative.

RESPONSE TO LETTER 70

70-3 Your comment regarding support for the Northern Alternative due to a lower potential for contamination of the Edwards Aquifer is noted.

70-4 Your comment regarding the sensitivity of surface water bodies providing public water supplies is noted.

Please refer to Mitigation Measure SS-2 in Appendix A of the Final SEIS for a list of block and check valves for sensitive water bodies.

70-5 Please refer to Tables 4-8 and 4-38 of the Draft SEIS for a direct comparison of the Proposed Route and Northern Alternative regarding this issue.

70-6 Please refer to the Modifications and Corrections section for page 4-6 which provides a discussion of the issue of chronic low-volume oil leaks from the pipeline.

LETTER 70

70-7 5. In addition to the potential threat to the Edwards aquifer from pipeline operation, we believe there is a potential for pipeline construction to have adverse impacts on the aquifer and near surface geologic features, including groundwater recharge features. The measures proposed for reducing the frequency and magnitude of oil spills, such as installing the pipeline at a greater depth, lining of the trench, and filling of solution features increase the potential for construction impacts. Numerous studies have noted the sensitivity of the Edwards aquifer to non-point source pollution, such as that caused by construction activities. The Texas Speleological Survey reports several significant karstic features, such as Winnie Philips Bat Cave, adjacent to the proposed route, and indicates a likelihood of significant solution features along the proposed route. The northern alternative essentially avoids all karst areas.

70-8 6. The proposed route has potential adverse impacts on Barton Springs, a significant recreational resource for hundreds of thousands of people. The potential for impacts on this resource would be avoided by use of the northern alternative.

70-9 7. The proposed route entails a greater risk to sensitive ecological resources than does the northern alternative. This is apparent from examination of the data presented in the DSEIS on potentially affected threatened, endangered, and rare species. Table 3-11 shows that, according to the U.S. Fish and Wildlife Service, three federally listed threatened and endangered species may occur in the vicinity of the proposed route which are not potentially affected by either the northern or southern alternative. In regards to the Black-capped Vireo, a Federal Candidate Category 1 species which is of special concern to the City of Austin, the proposed route would impact known nesting habitat (a nest occurs within one-half mile of the proposed route in Kerr County), while for the northern alternative the DSEIS states that it is known to occur within 15 miles of the route. This indicates a greater potential for impacts on this species with the proposed route. In terms of all threatened, endangered, or special status wildlife species expected to occur near the routes under consideration, examination of Tables 3-14, 3-47, and 3-66 reveals 53 species expected to occur near the northern alternative, as opposed to 57 species for the proposed route and 64 species for the southern alternative. In terms of sensitive plant species and natural communities present in the regions traversed by the three routes, examination of Tables 3-12, 3-45, and 3-64 reveals 9 species and 3 communities present in the region traversed by the northern alternative, as opposed to 19 species and 5 communities for the proposed route and 11 species and 1 community for the southern alternative. Examination of Tables 3-13, 3-46, and 3-65 reveals that 7 sensitive plant species/communities are present within a six-mile corridor along the northern alternative route, as opposed to 10 for the proposed route and 9 for the southern alternative.

Based on the analysis presented in the DSEIS, it is evident that the proposed route has a greater potential for impacts on sensitive biota, and therefore a greater level of environmental risk, than the northern alternative. Two species potentially affected by the proposed route, the Barton Springs salamander and Texas wild rice, are only known to

RESPONSE TO LETTER 70

70-7 Mitigation Measures G-1 and G-2 (in Appendix A) are proposed to identify and mitigate potential geologic hazards to the pipeline.

70-8 Thank you for commenting. Your comment regarding recreational use of Barton Springs and the potential adverse impacts to the Springs has been noted. An oil spill could reach the spring through surface runoff down Onion Creek or by a barge spill into the aquifer through recharge from Onion Creek.

70-9 Your comment regarding support for the Northern Alternative due to a lower potential for significant impacts to threatened and endangered species is noted.

Please refer to Tables 4-8, 4-38, and 4-50 of the Draft SEIS for a comparison of the oil spill risks along each alternative to threatened and endangered species habitat.

LETTER 70

70-9 Cont. occur in a single location, both associated with Edwards aquifer springs. The karstic Edwards Limestone provides habitat to several species of rare cave invertebrate fauna with an extremely limited distribution. Although the northern alternative has potential impacts on the threatened Concho water snake at the Colorado River crossing, the same measures proposed to reduce the likelihood and severity of an oil spill in the Edwards aquifer area could be employed at this river crossing to protect this species. Also, as discussed previously, clean-up efforts have a greater chance of success with spills into a surface water body.

Comments on Document Contents

We have the following comments on the contents of the DSEIS:

70-10 1. Table 3-2 shows municipal groundwater supplies within 2 miles of the proposed route. This is an arbitrary corridor which does not necessarily reflect those groundwater supplies potentially affected by the pipeline. As an example, the City of Buda is the largest single municipal user of the Barton Springs pool of the Edwards aquifer, yet it is not reflected in the tabulation because it is approximately 3 miles from the proposed route. It would be more appropriate to list municipal groundwater supplies within a reasonable distance downgradient from the route, to reflect municipal groundwater users potentially impacted by oil spills. (In regards to municipal surface water supplies, the DSEIS lists supplies up to 150 miles downstream of the routes.)

70-11 2. Barton Springs should be included as an important recreational resource potentially affected by the proposed route. This appears to be more relevant than Lake Travis, which is addressed as an important recreational resource even though it is many miles downstream.

70-12 3. The DSEIS should include such measures as greater depth of burial, more frequent marking, thicker-walled pipe, greater corrosion protection, and remote-control valves, as mitigating measures for sensitive stream crossings and aquifers with the northern alternative. Such measures are proposed to mitigate impacts on the Edwards aquifer with the proposed route, and it seems appropriate to utilize these same measures to mitigate impacts of the northern alternative on sensitive water resources.

70-13 4. The DSEIS should better address potential construction impacts on the Edwards aquifer.

RESPONSE TO LETTER 70

70-10 Your comment regarding well inventories is noted. Please refer to the revised Mitigation Measure GW-1 in Appendix A.

70-11 Based on your comment, Barton Springs has been included as an important recreational resource which would potentially be affected by an oil spill. Refer to Modifications and Corrections section for page 4-94 which has included Barton Springs as a potentially significant recreational resource.

70-12 Your comment concerning the universality of mitigation measures is noted; please refer to Comment 56-4.

70-13 Your comment regarding construction impacts is noted. Please refer to Mitigation Measure G-1 in Appendix A.

LETTER 70

70-14 5. In regards to potential impacts on the Carrizo-Wilcox aquifer, the figures on Table 3-1 giving the approximate length of the pipeline through the outcrop appear to be transposed for the northern and proposed routes. Our analysis of maps 2-2, 2-3, and 3-1 indicate that the proposed route traverses about 16 miles of the Carrizo-Wilcox aquifer outcrop while the northern alternative traverses about 13 miles of this outcrop. On Table 3-1 these figures are transposed. This is misleading to those who may be concerned about potential impacts on this sensitive aquifer.

Please contact me or Ed Rashin at 499-2550 if you have any questions regarding our comments.

Austan S. Librach

Austan S. Librach
Director
Department of Environmental Protection

AL:ER

cc: Jesus Garza, Assistant City Manager
Mitzi Cotton, Assistant City Attorney

RESPONSE TO LETTER 70

70-14 Based on your comment, revisions to Table 3-1 have been made. Please refer to the Modifications and Corrections section for page 3-3.

LETTER 71

T-BAR RANCH
Rt.1 Box 198
Cameron, Texas 76520

H.P. Tumlinson J.W. Tumlinson Dr.R.G. Tumlinson R.R. Tumlinson

March 27, 1987

Mr. William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh,

I am submitting this statement on behalf of the owners of the T-Bar Ranch in response to the Bureau of Land Management's Environ-Impact Statement concerning the All American Pipeline's "Northern Alternative" proposed route through Milam County.

Our late parents, Mr. and Mrs. O.G. Tumlinson, established this ranch the hard way beginning in 1947. They lived in shacks and survived severe droughts and floods and a breaking cattle market to get it started. All of their sons worked on it at one time or another, and R.G. Tumlinson worked it full time with his father beginning in 1955. When O.G. died in 1962 R.G. continued it on a lease with the rest of the family. Since 1979 he has continued working it with his son, James, the current lessee. Although our economic condition has gradually improved over the years, it is still a challenge to operate it on a paying basis. It doesn't take much of a distraction to bring on a crisis.

But the Ranch is much more than a business. Over the years it has become a family institution. Many family re-unions have been held under its pecan trees or on the River bank. It is one of the main ties for children and grandchildren scattered around the country. And it contributes to the quality of life for the community. Fishermen like to come in for a day of relaxation. Today the Boy Scouts are out here conducting a map excercise. This is certainly a picture of the realization of the American Promise.

But now, as if in mockery, comes the heavy tread of the "All American Pipeline Company" into this busy but tranquil scene. The early news releases about the "Northern Alternative" route through Milam County were disturbing, but inadequate to alert us to the full extent of this ominous threat. Rumors began to fill in the gaps, however, and stories from people who had suffered previous experiences with pipelines contributed to our unease. By the time the Supplemental Environmental Impact Statement by the BLM arrived at the County Judge's office late in January we felt our worst fears were justified.

71-1 Nowhere in the news accounts was there the slightest hint that the "All American" company would pay any attention to the individual land owner who happened to be in the way. All we could think of was the power of Eminent Domain. The only reason the BLM got into the

RESPONSE TO LETTER 71

71-1 The Introduction (page 1-1) of the Draft SEIS discusses how the BLM became involved in the McCamey to Webster pipeline segment.

LETTER 71

T-Bar Ranch
page 2

act, according to Texas Attorney General Jim Mattox, was because the pipeline happened to cross some Federal land along the way. And the mass of technical information that had been compiled seemed to favor the proposed route, although it was obvious to the people who lived in the area that it was far from adequate. But it was a real "catch-22" situation confronting the small landowner. In a relatively short period of time he was required to respond to all this technical data that had been years in the making by large institutions well-staffed with experienced personnel and with unlimited resources.

The landowner lives in this environment, however, and ordinary observation and experience certainly qualify him to make some sensible judgements about the matter. We thought it incredulous that the All American Company would even think about crossing the Edwards Aquifer, but we have an aquifer, too, in the Wilcox, and we don't see that it would be any less damaged than the Edwards. Water, of course, is our first concern. And, whether it is considered from an economic or an environmental standpoint, the results could be devastating. Man and animal alike depend on our springs and water wells for survival. 71-2

U.S. Geological maps show a heavy concentration of fault lines in southern Milam County, especially toward the Minerva-Rockdale Oil Field which the Pipeline proposes to go right through the middle of. Oil men say these fault lines are the reason we have an oil field there. And they are also the reason said pipeline could be ruptured over and above the Company's statistical possibility of such an event. 71-3

After all the data submitted by the BLM in regard to wildlife it gives the impression that there is nothing worth saving in this area. Although we might be willing to give up a few jackrabbits and rattlesnakes, we don't need the Pipeline for that. We have natural ecological controls such as coyotes and roadrunners, and we do like to have them around. We also like to have quail for pets, and egrets and flocks of cranes that feed in the creeks. 71-4

I could go on at great length about many other natural wonders we like to have around here, not to mention cultivated fields and buildings that are not compatible with pipelines even when they operate according to plan, but I am under the gun to meet the deadline. Suffice it to say that we consider this project a time bomb, and the question is more "when?" than "if". 71-5

Sincerely,

H.P. Tumlinson

H.P. Tumlinson
and brothers

RESPONSE TO LETTER 71

71-2 Thank you for commenting. Please refer to the response to Comment 30-1.

71-3 Please refer to the response to Comment 56-48 regarding potential seismic hazards.

71-4 Your comment is noted. A description of wildlife resources along the Northern Alternative may be found on pages 4-125 through 4-128 of the Draft SEIS. The desires of the individual landowner will be addressed in terms of pipeline ROW compensation and reclamation practices. Long-term impacts to wildlife are not expected.

71-5 Your comment regarding pipline construction in cultivated fields and at buildings is noted. Since the pipeline would operate according to plans, construction in agricultural areas can be accomplished successfully. The pipeline would be installed below plow depth, thus not interfering with the operation of the cropland. Temporary impacts associated with pipeline installation would be minimized by the timely restoration of the disturbed surface to the existing use of the land (see Chapter 2 of the Draft SEIS). Loss of crops or reductions in soil productivity would be compensated for by AAPL. It is true that the pipeline cannot be installed under buildings since this would interfere with the monitoring and inspection of the pipeline during operation.

LETTER 72

SIERRA CLUB

LONE STAR CHAPTER

E. H. Rudenberg, Ph.D.
3327 Avenue Q 1/2
Galveston, Texas 77550
March 26, 1987

William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside CA 92507

Dear Mr. Haigh:

These comments pertain to the DSEIS: Proposed All American Pipeline Project McCamey to the Gulf of Mexico. There are numerous problems with this EIS which must be rectified.

Items which are left out include:

72-1 1. Why to Webster, Texas; is there sufficient buffer (acceptance) capacity there at present or will more capacity be needed? What will happen to the oil delivered?

72-2 2. Why to Texas City/Arco? Is there sufficient buffer (acceptance) capacity there at present or will more capacity be needed? The discussion at the bottom of page 1-17 suggests that this is not a sound proposal - clarify. If export of crude from Texas City is contemplated, how does this fit with the need to import which has stimulated the Federal project to deepen the TC Channel? Texas City should not develop into a trans-shipment point for marine transport of crude oil. If there is a sound argument to consider TC, then a discussion of the potential impact of oil spills into Galveston Bay of the "light crude" (page 1-6) is needed. Without the pipeline this would not threaten Galveston Bay. Crude oil should be kept out of vessels in Galveston Bay; hence, why not deliver export crude oil to Freeport?

72-3 3. Texas City, Galveston, and many nearby communities rely on canal delivery of surface water, much of it from the Brazos and Oyster Creek. Canals will be crossed by the proposed pipeline. Why is this not discussed. This area is absolutely dependent upon water delivered through the Galveston County Water Authority and this is equally as important as that elsewhere in the State, if not more so because of the industrial needs and limited roadway access, since we are coastal communities. There is need for remote controlled valving, mitigation discussion, and the bringing in of potable water if needed. An 8-hour interruption is grossly underestimated (4-180, SW-1).

72-4 4. What is the extent of liability and bonded availability in the event there is a spill, considering the TRUE worst case incidence?

72-5 5. Why is only one northern and one southern alternative given? Why are no alternative locations for pumping stations given (within the limits of technical need)? Why are no alternative delivery terminals given? This is even more important if new tankage is needed (1 & 2 above).

72-6 6. If delivery to TC (or alternate) is valid, why is there no discussion of the PADD needs? Only Padd 5 (west coast) and PADD 3 (Gulf States) are discussed (3.2.12.6 ff). And justify need for ship transport.

72-7 7. Since important species survive on other species, why is the aquatic biology section so limited? Oil spills will affect the food sources of all organisms in the "chain" and it is inappropriate to consider only selected organisms.

"When we try to pick out anything by itself, we find it hitched to everything else in the universe." *John Muir*

RESPONSE TO LETTER 72

72-1 AAPL indicated that the capacity of the Texas City and Webster terminals is sufficient to accept the 300,000 BPD throughput.

72-2 The Webster terminal is a tank farm and pipeline interconnection point for Exxon. The Texas City terminal is a major distribution center for Gulf Coast refineries through pipelines and barges. Texas City also has a larger refining capacity. AAPL plans to displace heavy foreign crude with heavy California crude in the Gulf Coast refineries. The crude oil distribution system at the Webster and Texas City locations has the capability to accomplish this goal. The exact volumes for storage and distribution at the two terminals is proprietary and is not available; in addition, contracts with specific shippers and refineries have not been identified at this time.

72-3 The pipeline to both termination points, Webster or Texas City, will cross the Brisco and American Canal. The canals are owned and operated by the Brazos River Authority and are used to transport Brazos River water to the Galveston County Water Authority and to irrigation customers along the way. The Galveston County Water Authority sells the water to local industries or treats and sells it to local towns for municipal use. The canals drain into two reservoirs which have an average of 8,100 acre-feet of storage. This represents approximately a 30 to 45-day supply of water.

The pipeline will cross beneath the canals through a bored horizontal hole; therefore, not disturbing the canals. It is unlikely that oil would enter the canals in the event of an oil spill. If oil did enter the canal, the canal would be closed to prevent contamination of the water supply. The Galveston County Water Authority would continue to provide uninterrupted water resources, due to the continued water supply by the uncontaminated canals.

An Oil Spill Contingency Plan will be prepared prior to pipeline operation. The Oil Spill Contingency Plan will be site-specific for sensitive crossings; see Modifications and Corrections Section 3.2 for Table B4-1a.

72-4 Please refer to the response to Comment 18-2.

72-5 The criteria for selection of the alternatives are described on page 2-34 of the Draft SEIS. The pump/heater station locations were selected by AAPL based on engineering design information. These locations would be subject to minor relocations based on the determination of significant impacts to an environmental resource.

72-6 Your concerns for supply and demand are noted; please refer to the response to Comment 56-1.

72-7 This issue has been raised in a preceding letter. Please refer to the response to Comment 56-49.

LETTER 72

72-8 8. Discussion of true worst case. A single failure is perhaps easiest to rationalize statistically. But in reflecting back on potential causes of accidental spills suggests failure of other factors coincidentally. These might include the electrical control of valve closure, operator error, road washout hence access, etc. etc. Further, there is no discussion of what happens at the pump stations if there is a detected spill -- it would seem insufficient to only close valves. And what happens if the heavy crude cools excessively before flow can be reinitiated? Appendix C is naive. Average spill volumes may give the appearance of credibility, CEQ regulations require a true worst case discussion. This also pertains to discussion where a situation cannot be accurately estimated, e.g. the acid rain formation on page 4-89.

72-9 9. It is common practice when installing pipelines in wetlands to "double ditch", that is to preserve the top soil separately from the lower, less valuable soil or rock. This practice should be used wherever possible. Certainly, section 4.7.16 this and other mitigation methods should be explained to all private landowners and offered at no charge to them. The landowners would not likely know unless All American is obligated to tell them. Topsoil must be saved, and not wasted. (also 2.2.2.2 ff). By the same token the 50 feet of construction right of way which is not operation right of way should be reztored to equal vegetational productivity as soon as possible by active methods, e.g. 4-64 concerning Ashe juniper. Further, the specific corridor should avoid especially old trees so that they are not destroyed unnecessarily.Perhaps a 40-year old tree would be in need of saving.

72-10 10. Noise screening by means of shrubs and trees should be required at pump stations and be a mitigation aspect (4-194 add N-2).

72-11 11. Page 4-103 needs more on roadway maintenance, vehicle crossing, and suitable detour sinage to be placed so as to protect (local) emergency movements from losing time during construction phase.

72-12 12. Seemingly arbitrary milages are used for protection from blast damage. Since seismic focusing is well known, it likely will be appropriate to utilize an expert so as to assure that seismic damage to caverns will not occur.

72-13 13. Abandonment is not clearly thought through and thus seems not to be consistent, e.g. 4.2.1.4. If cathodal protection is removed and the abandoned pipeline is filled with water, there will eventually be a collapse which should be avoided.

72-14 14. If local fire departments are expected to handle local fire emergencies which are pipeline-related, then management has an obligation to help train, provide suitable foam perhaps, etc. Because of the added consideration of heating, and possible cooling/congealing after an accident, much greater thought must be given to the handling of fires and their aftermath.

Problems in the information provided:

72-15 15. Page 1-5 very top. This leaves no time between the end of the public comment period on the FSEIS and the BLM Record of Decision. This must not be.

72-16 16. page 2-7 bottom provision of natural gas and electricity also require easements and construction corridors. Don't leave these out. Will back-up power be needed?

RESPONSE TO LETTER 72

72-8 The Onion Creek to Edwards Aquifer oil spill scenario has been revised; please refer to Appendix B of the Final SEIS. A description of pump station response to oil spills is included.

72-9 Your comments regarding topsoil and restoration are noted. Please refer to the revised Mitigation Measure TB-1 which states that all construction activities will be supervised by the BLM Authorized Officer. Reclamation will occur using appropriate materials and techniques as suggested by local SCS revegetation specialists with input from private landowners. In addition, Mitigation Measure S-1 discusses other means of restoration that the Authorized Officer may require to be implemented.

72-10 Please refer to the response to Comment 56-151. Please also refer to the Mitigation Measure SS-9 in Appendix A (System Safety).

72-11 Significant impacts are not anticipated, however, Mitigation Measure T-1 in Appendix A is included to provide the Authorized Officer authority to repair damaged roads.

72-12 Please refer to the response to Comment 6-2 regarding blast design.

72-13 Abandonment practices to be used by AAPL are consistent with regulatory requirements and standard industry practice.

72-14 Pipeline or pump station fires will be controlled by the Emergency Response Team. However, for containment of fires outside of the oil spill itself, such as surrounding grasslands or brushlands, the Emergency Response Team will be assisted by the local fire departments. The local fire departments conventional equipment is adequate for handling fires on natural lands.

A discussion of local fire department response is given in the Modifications and Corrections section for page 4-5.

72-15 The statement is correct as written. The BLM cannot issue a Record of Decision until at least 30 days have elapsed from the date the Final SEIS is published. At the discretion of the BLM California State Director, the Record of Decision may be issued more than 30 days following publication of the Final SEIS.

LETTER 72

72-17 17. Page 2-12. I trust inspection and monitoring of pipe will exceed that reputed to have not occurred for cruisers being built for the Navy; i.e. more information seems warranted regarding technical assurance, monitoring during handling, etc. This appears especially important here since this pipeline could impact aquifers and the coastal area which are highly sensitive.

72-18 18. Section 3.2.3.3 as indicated needs to be expanded to cover the water supply canal system to Galveston County which at least in one place is crossed by the proposed pipeline route, the County Reservoir being located between the proposed route to Webster and that to Texas City. Other sections and tables need to be adjusted appropriately.

72-19 19.The severe weather data should include the 1979 rains in Galveston County and the 1983 hurricane, Alicia. Data available from Galveston District Corps of Engineers.

72-20 20. Table 3-25, page 3-92. The assessed valuation for Harris County is a typo here and on 3-163, and likely correct on 3-227.

72-21 21. Page 4-1 The 4 criteria are insufficient. ADD: 2a At any point along pipeline, is a spill, explosion, or fire, should it occur, acceptable? 3a What are the impacts of clean up following such events? and 5 If there is an oil spill, explosion, or fire, can it be brought under control promptly?

72-22 22. Section 4.2.1 and page 2-32. Will there be pipeline reinspection during the 40 years? (not the route only). As clearly implied, the pipeline is in better condition on day one than later.

72-23 23. Table 4-4. These data may not be relevant because of all the differences in diameter, pressures. ages, and contents (internal corrosion). A rate of 5.6×10^{-2} is 5.6 per 100 miles which for 500 miles eqates with 28 per year. This not very reassuring, yet perhaps honest!

72-24 24. page 4-13 the four bullets; last one does not affect spill rate!

72-25 25. Table 4-5 valve closure time. Worst case must be given, not "average".

72-26 26. Page 4-15, 6 bullets; How do you adjust for pipeline age over the projected lifetime? Page 4-16 2nd full ¶-- a poisson distribution is not likely. As indicated, you must use WORST case. Perhaps even sabotage must be considered. Page 4-20 the use of helicopters sounds good but in actual fact may not be implementable. Table 4-9 is not worst case.

72-27 27. 4-25, 4.2.2.1 (1) develop a permanent alternative water source: how long does that take and how large will it have to be? Again, use worst case.

72-28 28. 4-43. It is ok to be honest, but a worst case must be cited by law.

72-29 29. Page 4-51 The significance criteria are inadequate, as already noted. Also include opportunities for reproduction being affected.

72-30 30. Page 4-61 and 4-62, provide cross reference to mitigation proposed. 4-62 the top full paragraph sounds sloppy.

72-31 31. Page 4-66. the relevance of these citations may be lost unless the quality of the crude oil used is similar to that proposed here. High sulfur crudes likely are more damaging.

RESPONSE TO LETTER 72

72-16 The exact locations of the pump stations have not been finalized, and thus, the utility corridors have not been defined. Because the utility corridors will be short, generally follow existing roads or corridors, and will be constructed under the supervision of the BLM Authorized Officer, the potential impacts should not be significant. See Mitigation Measure LU-4 in Appendix A.

72-17 AAPL quality assurance procedures for pipe manufacturing are stated on page 2-12 of the Draft SEIS.

72-18 Please refer to the response to Comment 72-3.

72-19 Your comment concerning the inclusion of the 1979 rains in Galveston County and the 1983 hurricane, Alicia, in the severe weather data is welcomed.

A severe weather event was indeed recorded in July 1979 in Galveston County as a result of Tropical Storm Claudette. A 24-hour total of 16.95 inches was recorded at the Weather Service Meteorological Observatory in Galveston. Table 3-17 (see Modifications and Corrections Section 3.2) in the Final SEIS has been changed to reflect this event. As with all weather events, localized extreme values of 24-hour precipitation may be unofficially recorded. In this case, such a value was recorded by an observer near Alvin, Texas. A 24-hour precipitation amount of 42 inches was recorded by this observer. In contrast, the total storm rainfall recorded over a 4-day period at the Weather Service Office in Alvin, Texas was 30.70 inches.

With regard to hurricane Alicia in 1983, it is true that extensive damages were incurred during this storm. However, they were due largely to the heavily populated area at the landfall location of the hurricane. Meteorologically, Alicia was rated as only a weak to moderate hurricane. Rainfall totals resulting from Alicia were not severe when compared to other historical events in the region.

72-20 Based on your comment, Tables 3-25 and 3-52 have been revised; please refer to the Modifications and Corrections section for pages 3-92 and 3-163 which list the correct Harris County assessed valuation.

72-21 Please refer to the specific discipline discussion of oil spill impacts for the answers to these questions. The questions that are raised in your comment are addressed in the four risk questions on page 4-1 of the Draft SEIS.

72-22 DOT regulations in 49 CFR Part 195 require that AAPL inspect the condition of various components of the pipeline and the operating system at specified intervals.

72-23 The data in Table 4-4 in the Draft SEIS were supplied in response to scoping concerns regarding the statistical data base used to estimate spill rates. The justification for the use of the spill statistics chosen is given on pages 4-10 through 4-13 of the Draft SEIS.

72-24 Leak detection monitoring is effective at reducing spills due to operator error. Please refer to page A-3 in Appendix A of the Draft SEIS.

72-25 Average valve closure times were used to calculate average spill volumes. Please refer to Tables 4-9, 4-39, and 4-51 of the Draft SEIS for valve closure times to specific receptors.

LETTER 72

72-32 32. On page 4-67 end of second-from bottom PP: while oil may be contained, that which dissolves in the water will continue merrily downstream, there to harm organisms. This must be discussed also.

72-33 33. 4-84 and Table 4-29 the use of "Gulf Coast" refineries is too broad a concept. Stick with refineries which are relevantly close. Relate Table 4-29 to 4-30.

72-34 34. Page 4-90 4th bullet. The arbitrary use of 5% is not acceptable. 1% at most.

72-35 35. Page 4-102. 2nd bullet. again 30 minutes is an arbitrary number. Page 4-103 here 335 plus 50 workers generate "385 worker trips" yet page 4-104, 50 truck loads generate 100 trips. In actuality, these trips WILL deteriorate local roads, especially if unpaved, and repair must be included in the cost.

72-36 36. Table 4-47, and its equivalent for southern route do not give all communities for spread 2. Be complete.

72-37 37. Table 4-57. The fish composition for highland bayou should be known and recently was detrimentally impacted by oil well brine discharges (see County Health District and Corps of Engineers).

72-38 38. Page 4-171 4.4.15.1. That the Southern Alternative would pass through more communities depends upon the exact path taken. As already cited, why are no alternate routes for these alternatives provided, or justification why not.

72-39 39. Section 4.6 This section on Cumulative Impacts is entirely inadequate. Certainly, projected local impacts in the Webster, Texas City/Galveston Bay area are many and must be included.

72-40 40. Page 4-175 SS-2 is only as good as operator awareness. This could be zero if he is in the john when the warning goes off? The staffing in Austin is not adequately described.

72-41 41. Page 4-184, TB-3 this 0.5 mile seems arbitrary and likely should vary depending upon local needs (just as there are no deer crossing signs all over, but just where needed). Wildlife experts should be consulted as to where this number is excessive.

72-42 42. Page 5-3. I note that the Texas City Surface Water Department has been consulted. But why not the Galveston County Water Authority? Also show the canal route, WITH SYMBOLS, on the appropriate maps.

72-43 43. A-4 Describe the nature of the cathodic protection system. Internal corrosion RATE is not related to thiskness of wall. Page A-9 Is pressure always related to viscosity? how does this affect flow out of a leak? Table A2-4 Note: That probabilities cited earlier are statistical estimates should be stated AND Worst Case must be used too.

72-44 44. The Oil Spill Contingency Plan is a part of the EIS and must stand Public Review.

72-45 I hope that these comments are of help. We support the contention that the Proposed Route is too hazardous in crossing the Edwards Aquifer. We also oppose the use of the ARCO terminal as a relay for vessel export of crude oil. We look forward to correction of the items given above. Thank you for this opportunity to comment.

Sincerely yours,

F. Hermann Rudenberg

F. Hermann Rudenberg, Conservation Chairman, Galveston Group, Sierra Club

RESPONSE TO LETTER 72

72-26 Please refer to page A-3 in Appendix A of the Draft SEIS for the derivation of the composite age factor. Poisson distributions are an appropriate statistical means to estimate probabilities of rare events. Helicopters were only a suggestion to be considered to decrease deployment times for reaching manual block valves at certain locations. The assumption of a full diameter rupture used in Table 4-9 (of the Draft SEIS) and similar tables for the other alternatives is a catastrophic assumption.

72-27 Your comments regarding time involved to develop a permanent alternative water source and size for a catastrophic scenario have been noted. Construction of a new water well can be completed within one to two weeks. Completion of delivery systems from other locations depends upon the distance of the alternate water supply from the affected source and construction conditions, as well as the time it takes the local population to agree to a particular permanant alternative source. The source must be large enough to accommodate the historic use of the affected population. Also please refer to the revised Mitigation Measure GW-3 in Appendix A.

72-28 We cannot locate the reference to "worst-case" on page 4-43 of the Draft SEIS.

72-29 The issue of reproduction being affected is addressed in the significance criteria on page 4-51, bullet 2, of the Draft SEIS by referencing ". . . portion of spawning or rearing areas of important recreational and commercial fish species. . .".

72-30 The text on page 4-62 has been revised to include the reference to Mitigation Measure LU-3. See Modifications and Corrections section for page 4-62.

72-31 Your comment regarding the relevance of the quality of the crude oil is noted.

72-32 Your comment is noted. When booms or other methods are used to control and collect spilled oil, some crude oil fractions would be expected to dissolve or become entrained in the water. Entrained fractions would eventually be exposed to the atmosphere and volatilized. Dissolved fractions (generally in very small concentrations) would be transported downstream and diluted. Those entering the Bay or ocean would be further diluted and, because such a condition would not be expected to occur chronically, no impacts to classified species would be expected. General impacts of oil, including oil dissolved in water, were discussed on page 4-66 of the Draft SEIS.

72-33 Thank you for commenting. Insufficient data exist which describes the specific refineries that receive high sulfur crude oils. In addition, there is insufficient data which describes the potential distribution of the pipeline crude. References to Gulf Coast refineries relate to the source for Table 4-29 (of the Draft SEIS) and the potential refineries which could receive the project crude. However, for the analysis presented in Table 4-30, (of the Draft SEIS) only those refineries considered in the immediate area of the pipeline terminus were included in the indirect analysis.

72-34 Please refer to the response to Comment 56-123.

RESPONSE TO LETTER 72

72-35	The 30-minute delay criterion is an accepted threshold level adopted from other similar pipeline EISs. There is no inconsistency between 385-peak-hour worker trips and 100 temporarily dispersed truck trips. Any load in excess of state size and weight standards would require a special permit. Standard loads would be accommodated by most roads without significant damage. See Mitigation Measure T-1 in Appendix A for road damage losses should they occur.
72-36	Information on hotel and motel accommodations for the smaller cities and towns along Spread 2 of the Northern and Southern Alternatives is not readily available. This does not suggest that additional accommodations are not available. However, East Bernard, Rosenberg, Alvin, and Houston have been added to Tables 4-49 and 4-60 to reflect the entire second spread accommodations. Please refer to the Modifications and Corrections section for pages 4-135 and 4-168.
72-37	Discussions with fishery biologists at TPWD indicated that no surveys are known for Highland Bayou. However, as noted in Table 4-57 and on page 3-36, Section 3.2.6.1.7 of the Draft SEIS, fish fauna are expected to be similar to Chocolate Bayou and Clear Creek.
72-38	The final alignment will be adjusted to reduce disruption to individual residents, businesses, utilities, and other land uses. This can be done by minor ROW changes such as paralleling roads or moving away from subdivisions and business districts.
72-39	Please refer to the response to Comment 56-140 for a discussion of cumulative impacts.
72-40	The purpose of Mitigation Measure SS-2 (in Appendix A) is to reduce oil spill volumes at certain sensitive receptors by providing for rapid valve closure. This measure represents the most rapid response possible. The control staff will not be singular and the alarms are auditory and visual.
72-41	The 0.5 mile length is judged to be adequate under most conditions. In areas where heavy deer populations are observed, the Authorized Officer will determine whether the 0.5-mile limit on the open trench is adequate.
72-42	The Galveston County Water Authority has been consulted with regard to the All American Pipeline crossing the canals. Please refer to the response to Comment 72-3 for a discussion on the canals.
72-43	Please refer to pages 2-5 through 2-7 and 4-4 of the Draft SEIS for a description of the cathodic protection system. Increased wall thickness does act to reduce the rate of oil spills attributable to internal corrosion. Higher pressure in the pipe and lower oil viscosity both act to increase the rate at which oil may escape from a pipeline leak. The oil spill volume statistics were presented for both average and catastrophic oil spills.
72-44	The Oil Spill Contingency Plan is not legally required until six months prior to operation and is reviewed by the BLM Authorized Officer, DOT, TWC, and other regulatory agencies. Please refer to the response to Comment 18-3.
72-45	Your comments regarding opposition to the Proposed Route and to ARCO's delivery terminal have been noted. Thank you for commenting.

LETTER 72

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The Galveston Daily News

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Vol. 144, No. 348 | Member, Associated Press | TUESDAY MORNING, MARCH 24, 1987 | Texas' Oldest Newspaper | Daily 25¢ Sunday 75¢

Water authority bill expected to pass

By JOEL KIRKPATRICK
News Staff Writer

AUSTIN — A bill expected to pass the House of Representatives today could put Galveston County in the water business and could provide the county with up to 200 million gallons of water a day for the next 50 years, County Judge Ray Holbrook said.

Dr. Thomas Mackey, president of Galveston County Water Authority (GCWA), said, "What we are really trying to do is to provide perpetual water rights to the Brazos River for Galveston County. That's our dream."

The bill is being carried by State Rep. James Hury (D-Galveston) and is on the general state calendar in the House for today.

Holbrook said he believes the bill would help bail Brazos River Authority out of a situation whereby they are losing money on low-interest bonds.

Charles B. Smith of Galveston, negotiating on behalf of the GCWA with Brazos River Authority, said Monday he feels he is near an agreement by which Texas City industries would support acquisition by the GCWA and Galveston County of canals which run from the Brazos River to Texas City.

"I have nothing but praise for Texas City industries for their far-sightedness in supporting this project," Smith said. "The bottom line is, it guarantees surface water for Galveston County users for a long time into the future."

He said he had been working on the project since 1961.

At this time, industries in Texas City use about 60 million gallons of water a day, Smith said. The water authority presently obtains the water under contract with the Brazos River Authority. So the sources of water for the company's subscribers will remain unchanged.

Smith, who is a consultant for the Galveston County Water Authority, said the water contracts permit the canals at this time to call on the Brazos River for up to 113 million gallons of water per day.

But the contracts carry the right to receive, ultimately, up to 200 million gallons per day from the Brazos and through the canal system.

The system includes two canals: The American Canal Co. canal, which runs from the Brazos River near Richmond-Rosenberg to just south of Missouri City; and the Briscoe Canal Co. canal, which runs from just south of Missouri City down to the general vicinity of Chocolate Bayou, to the vicinity of the Mecom Ranch, and near State Highway 6 and then to Texas City.

Smith said there are about $5.5 million in bonds outstanding on the Briscoe Canal System and about $4 million on the American Canal System.

Holbrook said cities have traditionally supplied water for urban users.

"And until recently, no one in Texas used Brazos River water for potable (drinkable) water.

"Until the Galveston County Water Authority began to treat water supplies from the lower Brazos, it was generally thought the water was too expen-

See WATER Page 11A

Water

Continued from Page

ive to treat," Holbrook said.

In about 1965, the Brazos River Authority bought Briscoe and American Canal Co. bonds. Those bonds, at the then-prevailing low interest rates on issues of that kind, will run until about 2006.

The contracts between the Brazos River Authority and the canal companies run to the year 2009.

The bill before the Texas House today would permit county commissioners courts "to acquire by purchase, gift, lease, or other method of acquisition, except by condemnation, any property or an interest in property outside the county that the commissioners court finds necessary or desirable to obtain a surface water supply or to transport and deliver surface water."

Hury's bill also permits the county commissioners court to contract with any political subdivision of the state for management or operation of all or part of the property for beneficial use of surface water.

Contracts may be made on any terms commissioners feel are appropriate, but are limited to a term of no more than 40 years.

Dr. Mackey said the GCWA is in negotiations with the Brazos River Authority and is negotiating wit the industries and municipalities it serves.

"Water is a resource, like oil and gas," Dr Mackey said. "We're not trying to deny it to anyon along the canal system. But we are trying to contro our destiny. If we own the water rights int perpetuity, and if we own the canal that carries it then we will have water rights for the future."

Members of the board of directors of th Galveston County Water Authority are appointed b the Galveston County Commissioners Court. The include three engineers: Dr. Mackey, Star Duitscher of Dickinson, and Larry Vela, o Galveston. Vela is also secretary of the board. Othe directors are J. Fellman Seinsheimer III, vice president; Jim Yarborough Sr. of Galveston; Jelly Jones of Texas City; and Charlie Hall of League City. Joe Wilhelm is general manager of the authority.

Once the water authority bill passes the house, i will go to the State Senate, where it will remain for a month or so, then if it passes, it goes to the governor.

LETTER 73

RECEIVED
BUREAU OF LAND MANAGEMENT
1987 MAR 30 PM 12: 32
CALIF. DESERT DISTRICT
RIVERSIDE, CA.

Thorndale, Texas
March 25, 1987

William Haigh
Bureau of Land Mangement
1695 Spruce St
Riverside Ca 92505

Dear Sir --

I wish to register a Vehement Protest Against this Proposed Pipeline thru Texas.

73-1 We have worked hard, many years, to establish Rural Water Lines in and around Milano, Cameron a Rockdale Areas - and have a very good supply now of Pure Water. It would be sinful to plow through and ruin our Water Supplys, in any way.

Water is more important than Money, any day. I expect you know that. So-- NO, PLEASE NO to the Proposed Pipeline.

Sincerely

Mary McAnulty
Rt 2 Box 78
Thorndale, Tex 76577

RESPONSE TO LETTER 73

73-1 The All American Pipeline would be placed beneath all existing water pipelines. Excavation and pipe placement would be by machine and hand depending on the pipeline to be crossed. These crossings would have a minimum of 12 inches of vertical clearance from the existing pipe and would not be cased. An oil spill would not flow into a water line because the water lines are pressurized and an oil spill would be at normal pressure.

LETTER 74

March 15, 1987

RECEIVED

To: The Bureau Of Land Management
1695 Spruce Street
Riverside, CA 92507

We wish to comment on the inadequacy of the Draft Supplemental Environmental Impact Statement.

You have failed to take into consideration the effect the proposed northern alternative route for the pipeline would have upon our water supply and our game population.

74-1 As proposed, the pipeline would cross the watershed of three (3) of our farm ponds which are primary supply sources for household and livestock water. It would also cross a creek which supplies livestock and crop irrigation water, as well as water for my parents household.

74-2 If a break in the pipeline occured in this area, there is no possible way it could be adequately contained because of the immediacy of the situation. We would be completely ruined.

74-3 We are also concerned about the impact that clearing such a hugh right-of-way, with the resultant machinery presence and noise, will have on the local wild game. We have been working for years to build up the population of deer, turkey and quail and now get a major portion of our income from game leases.

This pipeline across us would greatly hurt all of this. We don't want any part of it.

C. T. McClatchy Jr

LaVerne McClatchy
Rt. 1, Box 47
Bangs, Tx. 76823

RESPONSE TO LETTER 74

74-1 It is unlikely that an oil spill would reach the farm ponds. The oil is very viscous and flows at 3 to 9 ft per minute. Dikes can be built to prevent the oil from entering the ponds.

It is uncertain which creek you refer to. Most creeks along the Northern Alternative are intermittent, and an oil spill would impact a very limited area.

74-2 Oil spills would cause localized damage to crops, water supplies, and terrestrial and aquatic resources; however, in most upland situations, these impacts are reversible through proper oil spill containment and cleanup. The on-scene coordinator is independent of the offending party and would ensure complete restoration. The responsible party, upon determination, would be required to pay financial restitution.

74-3 Your comment and concerns are noted. The overall effect of the project on game species and other wildlife is described on pages 4-57 through 4-68, 4-125 through 4-128, and 4-157 through 4-160 of the Draft SEIS for the Proposed Route, Northern Alternative, and Southern Alternative, respectively. Terrestrial biology mitigation measures (in Appendix A) are designed to reduce those impacts and provide for proper reclamation and rehabilitation.

LETTER 75

Advisory Council On Historic Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

RECEIVED
1987 MAR 30 PM 12:39

MAR 27 1987

William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

2-364

I am writing to comment on the draft supplemental environmental impact statement (DSEIS) on the proposed All American Pipeline Project, dated January 1987.

75-1 Our specific concern is with the way our Programmatic Memorandum of Agreement (PMOA) and Memorandum of Agreement (MOA) with BLM are presented on pages 4-188-192. Reviewing these pages against the actual content of the PMOA and MOA, I cannot see how you have derived the former from the latter, yet these pages purport to represent the "specific requirements" of the two documents.

Under no circumstances should the DSEIS represent the PMOA and MOA in a manner that is inconsistent with their actual terms. We request that you advise us as to the actual relationship between the language on pages 4-188-192 and the content of the two documents.

Sincerely,

Thomas F. King
Director, Office of
Cultural Resource Preservation

RESPONSE TO LETTER 75

75-1 A key sentence at the bottom of page 4-188 is in error in the Draft SEIS. Mitigation Measure CR-1 in Appendix A of the Final SEIS has been corrected.

LETTER 76

4400 Horizon Hill, Apt. 1516
San Antonio, TX 78229
March 25, 1987

William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

I am writing to comment on the All American Pipeline Project on behalf of the Alamo Chapter of the Sierra Club. We are in agreement with your assessment of the project. If a need to build a pipeline is indicated, the Northern route appears to be the lesser of the evils. As residents of San Antonio, we are particularly sensitive to the status of the Edwards Aquifer, our sole water source. We are strongly opposed to any project which could jeopardize the quality of our drinking water.

76-1 The Northern Alternative is projected to affect the least number of miles of sensitive aquifers of the three possible pipelines. Also, it would affect the fewest number of coastal areas and related aquatic species. Under the Northern Alternative only ten miles of riparian habitat would be disturbed. Again, sensitive animal species would be least disturbed by this alternative. Geologically, this alternative would be routed through areas conducive to construction of the pipeline, as opposed to the Southern Alternative.

We hope, that with due consideration, you will endorse the Northern Alternative of the All American Pipeline over the proposed route and the Southern Alternative since it appears to be the route which would have the least environmental impact on the surrounding habitats and resources. We look forward to hearing your decision.

Sincerely,

Wendy Silverman

Wendy Silverman
Conservation Chair,
Alamo Chapter, Sierra Club

RESPONSE TO LETTER 76

76-1 Your comment regarding support for the Northern Alternative is noted. Please refer to the response to Comment 1-1, regarding the vulnerabilty of the Edwards Aquifer.

LETTER 77

3-23-87

William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh,

I have reviewed the Draft Supplemental Environmental Impact Statement regarding the proposed All American Pipeline project and attended the hearing on the same topic held in Waco, March 12, 1987.

The route for the northern alternative appears to have been selected in haste (probably in reaction to opposition on the proposed route) and shows little evidence of a conclusion determined by research.

77-1 Of specific note is the failure to recognize the Edwards aquifer in the Washita Prairie where the pipeline will be located near several springs north and west of McGregor, Texas. A field trip to look at this aquifer is being conducted in conjunction with the South Central

RESPONSE TO LETTER 77

77-1 Your comment regarding the groundwater impacts of the Northern Alternative through McLennan County has been noted. Please refer to the Draft SEIS for Map 3-1 and Section 3.3.2 which indicates the lateral extent of the Edwards-Trinity Plateau Aquifer, as well as other major and minor aquifers along the Northern Alternative, and to Table 3-40, page 3-119, which identifies affected streams in this area. Also, please refer to Mitigation Measures GW-1 and SW-1 in Appendix A of the Final SEIS.

LETTER 77

Geological Society of America Meeting March 28-31. Several members of the Texas Water Commission, Texas Water Development Board, and Bureau of Economic Geology will attend.

77-2 The potential impacts of a spill in this area have not even been considered!

77-3 Another matter is the generally parallel route to Highway 84 along the Northern route and yet the pipeline is located far enough from the highway to dissect private property rather than only impact one boundary. This shows a disregard or lack of understanding for private property owners. I was further convinced of this attitude after listening to the representatives for the pipeline at the hearing. They do not seem to be looking diligently for a route that will minimize impacts or will be the best route economically and environmentally but they are simply looking for <u>any route</u> that is acceptable. They seem to take eminent domain as a God-given right.

77-4 Please consider the impact statement with these comments in mind and consider "no route", "alternative" routes, and "modification" of proposed routes. Thank you! Sincerely,

Sue C. Eggleston R.

RESPONSE TO LETTER 77

77-2 Your comment regarding a potential oil spill in the McLennan County region of the Northern Alternative has been noted. Please refer to the response to Comment 66-16.

77-3 The final ROW for the Northern Alternative, should it be selected, will be fine-tuned by AAPL prior to construction to minimize individual landowner impacts such as disruption of driveways, business activities, fences, and other micro-location features.

77-4 Thank you for commenting.

LETTER 78

March 4, 1987
Martin D. Werner
3403 Eagle Drive NE
Olympia, WA 98506
(206)456-0438

William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh,

I have read the Draph SEIS entitled "Proposed All American Pipeline Project" in detail and have enclosed some specific review comments with this letter. In general, I found the SEIS to have critical deficiencies which make a meaningful evaluation of the alternative routes impossible. Unfortunately, the deficiencies concern some of the most significant issues identified at the scoping meetings conducted last summer. For example, specific information which would permit a critical evaluation of potential impacts to groundwater resources along the various routes is lacking in this SEIS. A second example is the lack of effort in evaluating the potential impacts on the human population if groundwater was contaminated by an oil spill or leak. I believe there is only one statement in the entire SEIS which identifies human health as a relevant consideration; and that statement grossly understates the potential damage. The degree of detail given to terrestrial and aquatic biology seems adequate for a project of this magnitude; however, I find it ironic that comparable detail was not given to potential groundwater impacts and public health concerns. These latter items are certainly of great concern to the residents of Texas as express at the scoping meetings. While these are difficult issues to address and may be damaging to the All American Pipeline Company's desires, to make the SEIS relevant they must be addressed.

78-1

78-2

I hope that my comments are useful to you during your review process. If I can be of any further assistance please contact me.

Sincerely,

Martin D. Werner

Martin D. Werner, PhD

RESPONSE TO LETTER 78

78-1 Your comment regarding the level of detail concerning groundwater issues along the various routes is noted.

78-2 Your comment regarding impact to goundwater resources is noted; please refer to revised Mitigation Measure GW-1 in Appendix A. Your comment regarding human health impacts is also noted. Please refer to revised Appendix A, in Modifications and Corrections Section 3.3 of the Final SEIS.

LETTER 78

Martin D. Werner

Section 2.2.1

The SEIS states in this Section that "pipeline block and check valves would be located at strategic locations along the route". Rationale for the placement of these valves is presented for designated sensitive aquifer areas and river crossings, but not for the other locations. More detailed information is needed to evaluate the effectiveness of the proposed placement of these valves (and specifically to determine if those placed up to 43 miles apart are sufficient to protect that areas). Information that should be included relevant to these valves follows:

78-3

1. rationale for the location of individual valves,
2. degree of protection provided by valves for the area between adjacent valves (e.g., what would be the reponse time to a leak or spill; how much oil could escape in the specific areas; etc.),
3. rationale for chosing manual vs remote valves at river crossing and other environmentally sensitive areas, (Designing the pipeline with remote control valves at river crossings is prudent since a remote valve can be closed in 2 to 5 minutes; while, depending on its location, 1 to 4 hours are required to close a manual valve (Section 4.2.1.3). Furthermore, Table 4-9 demonstrates a strong positive correlation between valve closure time and projected volume of oil spill. The All American Pipeline Company should discuss why they are not providing the best possible protection at river crossings against large volume oil spills. Such spills would not only affect water quality in the rivers, but possibly also in aquifers since some of the rivers being crossed recharge aquifers. There are also sensitive aquifer areas (e.g., the Edwards Plateau Aquifer) for which the quicker response time of the remote valves may be prudent.)
4. projected response time to a manually operated valve in the more inaccessible and remote areas crossed by the pipeline.

Section 2.2.2.10

78-4

Cleanup and restoration proceedures for the ROW as presented are not specific or relevant to that area of the Texas Hill Country where thin soil and rocky terrain exist. Since 275 miles, or 56 percent, of the pipeline crosses that type of terrain along the Proposed Route this issue should be addressed.

Section 2.2.2.11.3

78-5

A short analysis of the expected effectiveness and the protection afforted by each of the special pipeline design features which would be used for crossing the Edwards Aquifer Recharge Zone and

78-6

Ellenburger Aquifer would be meaningful. For these analyses, please consider both pipeline spills and leaks. Additionally, describe the proposed multiple leak detection techniques to be used for the

RESPONSE TO LETTER 78

78-3 Please refer to the Modifications and Corrections for pages 4-4 and 4-20 regarding your concern about pipeline block valves. Also, see Mitigation Measure SS-2 in Appendix A for the location of remotely operated valves which have been required.

78-4 Your comment about cleanup and restoration procedures in the Texas Hill Country is noted. The most appropriate cleanup and restoration procedures would be decided by the BLM Authorized Officer with input from local SCS revegetation specialists and the private landowner. The Authorized Officer may also require additional restoration measures to be implemented where necessary; see Mitigation Measure S-1 in Appendix A.

78-5 Please refer to pages A-4 through A-7 of the Draft SEIS for estimates of how the special design features at the Edwards Aquifer recharge zone reduce the probability of an oil spill.

78-6 Please refer to the response to Comment 78-8 for information on leak detection techniques. Locations of block and check valves for the Proposed Route are listed in Table 2-4 in the Modifications and Corrections section.

LETTER 78

78-7 Edwards Aquifer Recharge Zone, and specify the number and location of the additional block and check valves for the Ellenburger Aquifer. Address the possibility of including additional safety features in the sensitive Edwards Plateau Aquifer Region.

Section 2.2.4

78-8 Detail is given in this Section, Section 4.2.1.2, Section 4.2.1.3, and Appendix A regarding the methods to be used for detecting oil spills and leaks, as well as their sensitivity and effectiveness. Additionally, some projected frequencies and volumes of oil spills based on historical records and on specific design characteristics of the proposed pipeline are presented. However, nowhere in the SEIS is information provided which would permit the following questions to be answered:

1. How quickly and accurately could an oil leak or spill be located on the pipeline (as opposed to simply being detected)?
2. How quickly could the pipeline be shut down and block and check valves closed in response to a detected and located leak at some of the more remote western areas which are over the sensitive Edwards Plateau Aquifer (It is understood that various areas would differ in this regard depending on the type of detection equipment installed, proximity of spill or leak to a block valve, type of valve(remote vs manual), accessibility of (and travel time to) the critical valve and spill or leak site, etc.)?
3. How much oil could escape in the more remote areas being crossed by the pipeline (again, this is clearly a site specific question therefore detailed information is required)?
4. How much oil could be released to the environment if a leak is below the detection limits of the proposed leak detection system (i.e., less than 0.01% of the oil flow)? What protection is offered against these small, but possible long-term, leaks over sensitive areas?
5. Will the policy of the All American Pipeline Company be to close down the pipeline as soon as a leak of any size is detected?

Section 2.6

The following statement was made in this section concerning comparisons of potential effects of oil spills between the proposed and alternative routes, "These impacts (referring to significant impacts to groundwater, surface water, aquatic biology, etc.) would depend on the size and location of the spill; therefore, it is not possible to quantify and compare potential oil spill impacts". Table 2-12, which summarizes general comparisons between the proposed and alternative routes follows this statement.

78-9 The purpose of an Environmental Impact Statement is to compare alternative actions regarding the

RESPONSE TO LETTER 78

78-7 Please refer to Mitigation Measure SS-7 in Appendix A of the Final SEIS regarding the application of additional safety measures for the Edwards Plateau.

78-8 The time required to locate a leak is dependent on a number of factors, primarily whether or not the leak reaches the ground surface. It is expected that almost all major pipeline leaks will be visible on the surface because the pressure of oil in the pipe is large enough to cause the earthen pipeline cover to be removed. Detection of a leak is performed by reconnaissance either from the ground or air in the region of the suspected leak. Estimated block valve closure times and estimates of oil volumes spilled are given for sensitive receptors along the pipeline route in Tables 4-9, 4-39, and 4-51 of the Draft SEIS. Data on chronic minor pipeline leaks are provided in the Modifications and Corrections section for page 4-6. AAPL's stated policy is to close down the line upon the detection and location of a leak.

78-9 Your comment regarding the level of detail concerning impact to groundwater resources is noted. In regard to a comparison of groundwater impacts, please refer to Tables 2-12, 4-63, 4-64, and 4-65 in Modifications and Corrections Section 3.2 and to the groundwater impact summaries for each alternative in Modifications and Corrections Section 3.4.

LETTER 78

78-9 Cont. potentially significant impacts they impose on the environment. Therefore, making specific comparison on critical issues is necessary to evaluate the alternative actions. Those comparisons cited above should not be dismissed. This is particularly true for impacts to the groundwater resources in the area since they were identified as the primary concern at various scoping meetings held for this proposed project. An EIS should provide details on a particular concern which are commensurate with the potential impact of the action and commensurate with the public concern expressed during the scoping process. On both counts this SEIS needs to address the potential impacts of the project to the groundwater resources of the alternative routes in much more detail than provided.

In Table 2-12 the number of sensitive aquifers potentially effected and the miles of sensitive aquifer area crossed by the proposed and alternative routes are listed. A sensitive aquifer is defined as "presence of a water table is within 100 feet of the ground surface or the presence of high verticle permeability that allows rapid infiltration to a deeper water table"- Section3.2.2.

78-10 However, for a meaningful comparison between routes the degree of sensitivity of these aquifers needs to be quantified so that the vulnerability of each unique stretch of aquifer to be crossed can be rated. Only then can a reliable analysis be made of the routes regarding their threat to groundwater resources in the area. Shallow unconfined sand and cemented sandstone aquifers and shallow unconfined fractured calcareous rock aquifers are both rated as sensitive in this analysis but these two aquifer types are vulnerable to oil pollution, and amenable to effective remediation by current cleanup technologies, to a very different extent. The degree of detail given to the aquifers in Table 2-12 is essentially meaningless in providing information to assess the impacts that could result from a spill on the various routes.

78-11 The degree of sensitivity or vulnerability of unique stretches of aquifer should be quantified by considering specific details of the aquifers. Such techniques are being refined by organizations such as the National Water Well Association (e.g., DRASTIC) and these techniques are recieving interest by governmental agencies such as the United States Geological Survey.

78-12 Another critical characteristic of the aquifer to be considered in this analysis is the "replaceability criteria". In a draft report, the Environmental Protection Agency has suggested that an aquifer's replaceability can be quantified based on factors such as the population served and the economic feasibility of replacing the present water source. For example, if the annual cost of replacing a water suppy exceeded a certain percentage of income in the area affected, then replacement sould be considered infeasible.

RESPONSE TO LETTER 78

78-10 Your comment regarding the level of detail for groundwater resources is noted. Based on your comment, Table 3-1 has been expanded. Please refer to the Modifications and Corrections section for page 3-3. The modification entails an addition to Table 3-1 (3-1a) to include; Coefficients of Transmissibility, Coefficients of Permeability, Coefficients of Storage, and Yield Values for the major and minor aquifers.

78-11 Your comment regarding the specific characteristics and vulnerability of various aquifer areas are noted. Please refer to the response to Comment 78-10.

78-12 Thank you for commenting. Your comment regarding "replaceability criteria" for aquifers has been noted.

LETTER 78

78-13 Another suggestion which would aid in quantification of the threat of a significant oil spill is to more thoroughly define the slopes to be crossed by the pipeline over the various routes. Pipeline construction over slopes requires techniques which might reduce the soundness of the pipeline. Also a pipeline rupture or breakage on a slope may render mitigation measures less effective than they would be on level terrain. The number of miles with slopes over 15% were listed for each route in Table 2-12; listing the number of miles with slopes over 10% and 5%, for example, would also be meaningful in analysing the safety of each route.

78-14 Finally, soil depth is an important factor to consider when attempting to assess potential effects of spills or leaks from oil pipelines. For example, knowing the percentage of distance for each route for which the depth of soil is less than the proposed buried depth of the pipeline would aid in comparing the potential impact of an oil spill for the various routes. (Sections 3.2.5, 3.3.5, and 3.4.5 contain general descriptions of soil characteristics for the proposed and alternative routes and Appendix D contains specific soil characteristics, but a meaningful analysis of these characteristics in not included in the SEIS.)

78-15 By performing the types of analyses suggested above a meaningful comparison could be made between the routes being proposed regarding potential impacts to groundwater resources and the human population. As indicated above such meaningful analyses are essential to meet the requirements of the SEIS and to respond to major concerns identified during the scoping process.

Section 3.2.2

78-16 Tables 3.2, 3.39, and 3.57 list communities which depend on groundwater supplies and which could be impacted by the proposed and alternative pipelines; however, no analysis is made of landowners, individually or collectively, who might be affected. This issue was raised at several of the scoping meetings. Protection of private wells is a real concern since many people depend on individual water sources, both for drinking water and ranching, in the areas to be crossed by the pipeline. Furthermore, these are the people who could be affected to the greatest extent by oil pollution. It is conceivable that a community could pool their resources and develop an alternate water supply or

78-17 treatment systems, but the same would be impossible for a single individual or family. Given the socioeconomic characteristics of Central Texas, this is a significant issue which should be addressed in the SEIS.

RESPONSE TO LETTER 78

78-13 The geologic hazards to the pipeline were evaluated and generally were not associated with steep slopes. Some impacts would be greater in the highly dissected area along the Southern Alternative and were identified in particular by aquatic biology.

78-14 Oil spill impacts on soils and terrestrial vegetation are based on loss of productivity. The areal extent of most surface spills is small and thus, most oil spill impacts are not significant. Your point has direct bearing on cleanup efforts, that is, less permeable rock or soil types enable more complete recovery of lost oil. This fact is useful to the on-site oil spill coordinator and would be evaluated at the time of the oil spill.

78-15 Your comment summarizing your concerns is noted. Thank you for commenting.

78-16 Your comment concerning potential impacts to private water supplies is noted; please refer to the revised Mitigation Measures GW-1 and GW-3 in Appendix A.

78-17 Thank you for commenting. Please refer to the response to Comment 78-16.

LETTER 78

Section 3.2.2.1.3

In this Section the following points are made;

78-18

1. The proposed route crosses the Edwards Balcones Fault Zone Aquifer approximately 0.25 to 0.75 miles north of the groundwater divide between the Austin subarea and San Antonio subarea of the aquifer.
2. The precise location of the divide may vary with pumping and recharge conditions.
3. The divide could shift to the north during periods of severe drought or heavy pumping, possibly resulting in portions of the proposed route temporarily occurring within the area of the aquifer where groundwater flows toward San Marcos Springs in the San Antonio subarea.
4. The San Antonio subarea of the Edwards Balcones Fault Zone Aquifer is a designated "sole source aquifer".
5. Groundwater in the Austin subarea flows toward the major natural discharge area at Barton Springs which is located 20 miles north of the proposed route.

These are very significant statements relative to the decision concerning the placement of this oil pipeline. Apparently, either or both subsections of this crucial aquifer could be impacted by an oil spill. The Edwards Balcones Fault Zone Aquifer is perhaps the single most vulnerable and valuable aquifer system in Texas which could be crossed by an oil pipeline; and the region of the aquifer and recharge zone which the pipeline proposes to cross is perhaps the most critical and vulnerable part of the of the entire Edwards Balcones Fault Zone Aquifer. The Bureau of Land Management should give primary consideration to these conditions during their decision making process.

78-19

Section 4.2.1.3 - Case Studies

Concerning the Shell Pipeline Corporation's puncture near Austin, the chances of one or two monitoring wells detecting groundwater pollution in a fractured, faulted limestone aquifer may be remote depending on the local geology. The fact that the wells are yielding negative results is no guarantee that a portion of the aquifer is not contaminated. This is precisely a major problem in placing a major oil pipeline over this type of aquifer. Predicting where the contamination will flow if it reaches the water table is extremely difficult, therefore efforts to protect the public's health and cleanup the site are hampered. Proposed techniques and their associated problems for monitoring contaminant spread, specifically in fractured limestone aquifers such as those crossed along the proposed route, are not discussed in this SEIS.

78-20

RESPONSE TO LETTER 78

78-18 Your comments regarding the statements in Section 3.2.2.1.3 concerning the conditions present in the Edwards Balcones Fault Zone Aquifer are noted.

78-19 Your comments regarding Section 3.2.2.1.3 and its consideration by the BLM are noted. Please refer to the response to Comment 1-1 concerning the vulnerability of the Edwards Balcones Fault Zone Aquifer.

78-20 Your comments regarding the Shell Pipeline spill in Travis County, Texas and associated problems for monitoring contaminant spread are noted. Please refer to the response to Comment 68-29 and the Modifications and Corrections section for page 4-23 for updated information on the spill. As stated in the Modifications and Corrections section for page B-53, site-specific oil spill contingency plans will be prepared for sensitive resources.

LETTER 78

Section 4.2.2.1

The potential for adverse health effects due to an oil spill or leak are dismissed in this section by stating, "Danger to human health is uncommon in the event an oil spill affects a drinking water supply because the concentration of contaminants necessary to cause toxic effects is greater than the threshold of the unpalatable taste and odor of the hydrocarbon-contaminated water". This statement is a gross and dangerous understatement of the public health concerns surrounding this issue. Perhaps the statement would be accurate if the only concern was acute toxicity. However, our environmental regulations are written to protect people, when reasonable, from carcinogens and other forms of chronic diseases. Crude oil is a complex mixture of hydrocarbons and many of these hydrocarbons are known or suspected carcinogens when exposure is to even very minute quantities over a period of time. Crude oils contain benzene and benzene derivatives, toluene and toluene derivatives, xylene and xylene derivatives, naphthalene and naphthalene derivatives, and numerous polycyclic aromatic hydrocarbons (PAHs), such as benzopyrene and benzanthracene, to mention only a small number of the compounds present. EPA is currently setting maximum contaminant levels (MCL) and recommended maximum contaminant levels (RMCL) for some of these organics based on known or suspected human health effects. In many cases the RMCL is being set at zero. The human taste and odor threshold commonly cited for these petroleum hydrocarbons is 5 ppb to 500 ppb, depending on the specific hydrocarbon of concern and upon individual human sensitivities. (In other sections of this SEIS a threshold of 5 ppb was cited, which is the "best case senario".) Note, the health criteria for these hydrocarbons are often lower than these threshold sensitivity concentrations. Additionally, metals which have significant adverse health implications may also be present in most crude oils.

78-21

78-22

Monitoring to detect the presence of hydrocarbons in groundwater is beset with problems due to the following factors. The spread of organic contamination in groundwater is controlled by many complex and interrelated physical phenomona. These include; dissolution, advection, diffusion, dispersion, adsorption, volatilization, etc. The result is a distribution of the contamination to form concentration gradients from the center of contaminant mass and the spreading of individual contaminants of the complex mixture at different rates through the aquifer. The latter is often referred to as the "chromatographic effect" and is displayed by the movement of a compex chemical mixture in aquifers. Low, but significant, concentrations of specific contaminants (which may not be detected by taste or odor) can reach drinking water wells long before the mass of contamination arrives, or is predicted to arrive. Intensive monitoring programs are required to assure wells are not being contaminated by low concentrations of these compounds. Such monitoring programs are particularly demanding when a fractured aquifer is contaminated because the rate and direction of contaminant flow, and even depth at which the aquifer is contaminated, is difficult or impossible to determine.

RESPONSE TO LETTER 78

78-21 Your comment regarding health effects is noted. Please refer to the Modifications and Corrections section for revised Appendix A Section 1.4; this section summarizes the properties and behavior of crude oil.

78-22 Please refer to the response to Comment 6-4 for discussion on the potential health concerns of oil contamination of drinking water supplies.

LETTER 78

In addition, biologically and chemically mediated reactions occur within aquifers which change the chemical characteristics of the contaminants. The resulting compounds may be unexpected and may represent even greater human health risks than the parent compound. For example, certain PAH metabolites which are generated by the aryl hydrocarbon hydroxylase (AHH) of the mixed functional oxidase (MFO) enzyme system act as dual mutagens and carcinogens. The enzyme systems which drive these reactions are present in nature and the PAH's referred to are common in crude oil.

The major solution offered in this section to deal with a contaminated water supply (when it is detected) is to develop an alternative supply. This is not feasible in many areas of Central Texas; and in any case groundwater is often the only economically viable water source for private water supplies. **78-23**

These are among the reasons which make the proposed route unsuitable for such a major oil pipeline. However, regardless of the route chosen, the All American Pipeline Company must adopt a reasonable view concerning human health risk created by an oil spill which contaminates an aquifer used as a water supply. The statement referred to in Section 4.2.2.1 does not demonstrate an understanding of the health issues or the seriousness of contaminating groundwater in the State of Texas. **78-24**

The above mentioned issues are major concerns expressed at the scoping meetings. They are important considerations during the construction of a major oil pipeline over vulnerable and heavily utilized aquifers, and they must be addressed in this SEIS.

Section 4.2.2.2

Concerns regarding trench excavation via blasting is covered in this section. A positive effect of blasting was described, that being increasing the hydraulic conductivity of the substrata in the vicinity of water wells and thereby increasing the well's potential productivity. However, at least one potentially negative impact of blasting was ignored. By blasting a trench through rock, installing a pipeline, then backfilling with broken rock fragments a preferred route for water, possibly contaminated by crude oil, is created. Conceivably, the contaminated water would follow the trench until a fracture or fissure in the natural geology transmits it directly to the groundwater aquifer. Small leaks which do not appear at the surface and are not detected by the proposed detection methods may eventually reach the aquifer in this manner. Note, this problem would be most serious for low density, low viscosity crude oils, and the soluble portions of all crude oils. Measures to detect such small leaks or to mitigate their effect are not presented in the SEIS. **78-25** **78-26**

RESPONSE TO LETTER 78

78-23 Please refer to Mitigation Measure GW-3 in Appendix A of the Final SEIS for details of mitigation procedures for water supply wells. Also, please refer to the responses to Comments 65-10, 68-9, and 72-27 regarding alternate water supplies.

78-24 Your comment on health risks is noted. Please refer to Modifications and Corrections Section 3.3 for revisions to Appendix A.

78-25 Aspects of blasting are discussed in the response to Comment 6-2. Blasting can also be designed to minimize backbreak; however, the concern here appears to be directed toward fractures or fissures in the "natural" geology. Please refer to Mitigation Measure G-5 in Appendix A.

Certainly the trench's contribution toward creation of a preferential route is recognized, but blasting of the trench versus mechanical ripping will have negligible impact on the existence or non-existence of natural fractures or fissures. Realistically, there is little that can practically be done to prevent fluid entry into such fractures/fissures short of lining the entire trench, in which case, overflow would ultimately find its way to those same fractures/fissures. Application of preventive devices (synthetic liners, shotcrete, grouting, etc.) can be implemented where the pipeline traverses obvious areas of concern; however, their effectiveness will be limited by natural ground conditions, distance between fractures, length of cover beyond fracture (fluids may well follow the preferential pathway under the liner ultimately finding their way back to the fractures), and characteristics of the leak.

This concern is more appropriately addressed through proper design integrity of the pipeline itself, including leak detection measures, operational plans, etc. Mitigation, after detection, would likely involve product recovery to the maximum extent achievable, though of questionable effectiveness in a highly fractured zone.

78-26 Please refer to the Modifications and Corrections section for page 4-6 for information regarding chronic low-volume pipeline leaks.

LETTER 78

Section 4.2.2.3

The following quote is taken from this section; "In the event of a spill into surface water , the oil could be carried downstream for a considerable distance before it would be contained; however, groundwater would not be affected substantially in downstream aquifers if spill containment is prompt and effective. This is due to the tendency for oil to float on top of the surface because of its lower density".

78-27 The above statement would not necessarily be the case for a recharge creek or river contaminated with crude oil. Components in crude oil dissolve in water to some extent, the overall solubility is dependent on the type and nature of the crude oil. The dissolved fraction would enter the aquifer along with the recharge water. Furthermore, sediment is often rather heavily contaminated with oil following a surface water oil spill. A major problem at many oil spill sites is that the contaminated sediments then become a chronic source of hydrocarbon contamination. That contamination can leach back into the stream's water, and thereby enter the aquifer, over the long-term.

78-28 Related to the points made above, while considering the effects and cleanup of oil spills and leaks in surface water or groundwater this SEIS has not adequately addressed the soluble fraction of the oil or the portion of crude oil which adhere to sediments or other solid materials.

2-376

Section 4.2.4.2

Unknowns concerning the type of construction to be required within 1-mile of the Caverns of Sonora, the effects on the Caverns of blasting in their vicinity, and the geology of the region are raised in this Section. However, no information is given on how these questions will be answered.

78-29 Thus, evaluation of a safety plan is not possible. Perhaps certain geophysical explorational methods would answer some of the questions raised concerning the vulnerability of the Caverns to various construction techniques, but these are not considered in the SEIS. Such a unique geological feature certainly should be protected by "state-of-the-art" explorative methods, construction techniques, or simple avoidance of the problem by altering the pipeline route.

Section 4.2.6.3

78-30 The expected duration of effects from crude oil spills is treated in this section. Published research which I have conducted indicated that ecosystem level effects due to oil spills (e.g., primary production to respiration ratios, patterns of nutrient cycling, the form of tropic structures, etc.) are longer lasting than toxic effects of oil pollution in freshwater systems. The references cited in this section did not measure such effects. Furthermore, several authors not cited in the SEIS have

RESPONSE TO LETTER 78

78-27 Your comment regarding the susceptability of aquifer contamination by an oil spill over a recharge creek is noted. Please refer to the Modifications and Corrections Section 3.3 of Appendix A regarding the properties and behavior of crude oil. Please refer to Appendix B of the Final SEIS for the revised Onion Creek to Edwards Aquifer oil spill scenario.

78-28 Please refer to the Oil Spill Contingency Plan in Appendix B of the Draft SEIS for additional information on cleanup procedures. The response to Comment 6-4 contains additional data on oil solubility and impacts to a river.

78-29 Please refer to Mitigation Measure G-3 and to the response to Comment 66-37. Mechanical ripping will be used within 2 miles of the Caverns of Sonora. Due to the extensive data available on ripping of stratified rock, it would not be warranted to employ elaborate geophysical exploration methods for pipeline construction. Please also see Mitigation Measures G-5 in Appendix A, regarding blasting.

78-30 Please refer to the response to Comment 56-94 regarding the duration of oil spill impacts on freshwater and marine aquatic resources.

78-30 Cont. studied long term effects of oil spills in marine systems and describe effects which last up to a decade as a result of sediment contamination.

Additionally, the SEIS does not discuss the duration which oil pollution would persist in groundwater. From a public health perspective this has greater significance than surface water pollution in many areas of Texas. Physical energy input from wind and waves, evaporation into a free atmosphere, and an ample supply of oxygen are factors which accelerate natural attenuation of oil contamination in surface water systems. These favorable conditions are not present in a typical groundwater system; therefore, oil contaminant attenuation is much slower in groundwater. Recent research has demonstrated another disturbing result relevant to the natural attenuation of organics in groundwater. Ultimately, final cleanup in many groundwater system is dependent on biological degradation of the contaminant. However, at low concentrations (which still represent a risk to human health) organics in groundwater do not represent an energy source sufficient to support biological activity. Thus, contamination of aquifers by certain organics may theoretically persist at low concentrations indefinitely. 78-31

2-377

Section 4.3.2.2.1

There are no details in this section or other parts of this SEIS to permit one to determine if the 117 miles of Edwards Plateau Aquifer crossed by taking the northern route is as vulnerable as the 275 miles of the similar Aquifer system which would be crossed by the western section of the proposed route. Details on the aquifers crossed, population dependency, associated soil conditions, and characteristics of the terrain should be presented so that this important comparison can be made. (See comment under heading for Section 2.6 for specific suggestions.) 78-32

Section 4.7.2

Measure GW-1

Information in this subsection is not sufficient to determine how detailed the "hydrogeologic investigation" will be or what "selected alignments" will receive this special investigation. For example, the following questions are not answered; 78-33

How will "sensitive areas" be designated within an aquifer?

What percentage of the total will be designated as sensitive for each aquifer crossed and where are these sections (or "selected alignments") located?

Will the detailed "hydrogeologic investigations" referred to be conducted continuously through the "sensitive areas" as implied?

What hydrogeological methods will be used to conduct the "detailed hydrogeologic investigations"?

RESPONSE TO LETTER 78

78-31 Your comment regarding persistence of hydrocarbon compounds in groundwater is noted. Please refer to the revised Appendix A Sections 1.1 through 1.4 in the Modifications and Corrections Section 3.3 of the Final SEIS.

78-32 Your comment regarding the Edwards-Trinity Plateau Aquifer is noted. Please refer to the response to Comment 35-1 regarding the vulnerability of the Edwards-Trinity Plateau Aquifer to an oil spill.

78-33 Mitigation Measure GW-1 has been revised; please see Appendix A. The hydrogeologic investigation will be conducted on the selected pipeline route.

LETTER 78

Section 4.7.4

Measure G-1

78-34 Information in this subsection is not suffiicent to determine how sinkholes will be identified and located along the route of the proposed pipeline. Will geophysical methods , such as siesmic techniques, be employed? Will an attempt be made to locate all sinkholes and underground caverns along the pipeline route? Similarly, what specific field evaluations will be used to evaluate fissures and faulting in the vicinity of the Caverns of Sonora as referred to under Measure G-5.

Measure G-3

78-35 No mention was made previously in the SEIS of the specific "special construction proceedures" which would be followed within two miles of the Caverns of Sonora. In Section 4.2.4.2 an area of concern within one mile of the Caverns was identified and blasting was presented as a potential technique for trenching in the vicinity of the Caverns. In this Section the area of concern is listed as two miles and blasting as a trenching technique is precluded. These discrepancies should be alleviated in the SEIS so that an evaluation can be made concerning the safety of construction plans in this unique area.

Appendix - B; Section 3.2.10.3

78-36 Based on what is presented in this section, it is apparent that the All American Pipeline Company understands that of all the "groundwater classifications" to be crossed, remedial action to cleanup a contaminated aquifer would be least effective in a fractured rock aquifer. In fact, the following statement is made; "In a spill involving a fractured rock aquifer, not all of the cleanup options are economically or physically feasible". The remainder of this sections fails to describe even one method that could be reliably used. Instead, the SEIS explains why methods that would be used for other aquifer types would not be effective for a fractured rock aquifer.

Most hydrogeologists would agree that effective contaminant cleanup in fractured rock aquifers is very difficult or impossible. This is due primarily because of the aquifers' heterogeneous nature and the presence of direct conduits (often from the surface) for contaminant transfer. Therefore maximum protection of the fractured rock Edwards Plateau and Balcones Fault Zone Aquifers is prudent, not only because they would not be amenable to effective remedial action in the event of an oil spill but also because the people in that part of Texas depend heavily upon those Aquifers for their water. (Note, Section 3.2.2.1 on pages 3-7 through 3-14 and Section 4.2.2.3 on pages 4-27 through 4-34 of the SEIS give a short overview of the various aquifers which would be crossed by the proposed route. These descriptions make clear the difficulty which would be encountered in any attempt to cleanup these fractured rock aquifers following an oil spill.) If there are specific

RESPONSE TO LETTER 78

78-34 Mitigation Measure G-1 has been revised; please refer to Appendix A of the Final SEIS.

78-35 Please refer to the response to Comment 78-29 regarding the Caverns of Sonora. Please also refer to the Modifications and Corrections section for page 4-43.

78-36 Your comment regarding effective cleanup of fractured aquifers is noted. Surface and near surface (to a depth of 8 to 12 ft) cleanup would consist of conventional removal and trench recovery operations. We do not know of any effective cleanup methods for fractured aquifers at depth. Thus, the only mitigative forces would be natural, such as biodegradation and dilution by percolating rainfall.

LETTER 78

11

78-37 techniques that can be used effectively to cleanup fractured rock aquifers they should be presented and discussed in the final SEIS.

Appendix B; Section 5

78-38 This section presents an outline of an "oil spill contingency plan". Will the final "Site-Specific Oil Spill Contingency Plan" be available for public review and comment or will it only receive agency review? Obviously, this plan is a critical aspect of safety for the operation of the pipeline; for that reason, it should receive the widest exposure for review as possible.

RESPONSE TO LETTER 78

78-37 Please refer to the response to Comment 78-36.

78-38 It is not the intention of the BLM to provide for a public review of the final Oil Spill Contingency Plan. Comments made by the public regarding the preliminary plan provided in the Draft SEIS will be considered by the BLM in their review of the final plan.

LETTER 79

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DISTRICT

7004 Kepner Court
Lanham, MD 20706
March 27, 1987

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

The enclosed comments on the All American Pipeline Draft Environmental Impact Statement are submitted in behalf of the Counties of Travis, Hayes, and Gillespie, and the City of New Braunfels. We appreciate the opportunity to submit these observations in order to receive consideration in preparation of the final document on which the final Federal decision will be made.

Should there be any questions please do not hesitate to contact me.

Sincerely,

John M. Cece, PhD

Enclosure

LETTER 79

REVIEW OF

Draft Supplemental Environmental Impact Statement

of

January 1987

for the

Proposed All-American Pipeline Extension

McCamey, TX to Webster, TX

prepared by

John M. Cece, PhD

7004 Kepner Court
Lanham, MD 20706

March 25, 1987

LETTER 79

The following comments have been prepared by John M. Cece, PhD, for, and submitted in behalf of the Counties of Travis, Hayes, and Gillespie, and the City of New Braunfels.

Specific Observations

p. 2-7; Section 2.2.1 Project Components

"Electric for pump operation and natural gas for the station heaters would be purchased from local utilities along the pipeline route (see Table 2-3)."

79-1 The DSEIS does not consider the reliability of these utilities, nor is there mention of backup service if there is a disruption in the primary service.

The electric service taps will be as long as 8.5 miles; and the natural gas taps will be as long as 3.8 miles (see Table 2-3). The report does not include discussion regarding the environmental impact of the installation of these services.

p. 2-12; Section 2.2.1 Project Components

"Each pipe manufacturer has multiple in-house quality control procedures which are applied sequentially during the pipe manufacturing process."

There is no indication that the quality control procedures of the various pipe manufacturers include a review and certification of their vendors and the materials provided by the vendors.

"All American has a third-party quality assurance program to ensure that each mill's internal procedures are followed. The procedures for this program will vary according to the previous performance of each mill."

79-2 It appears that All American has existing evidence regarding the previous performance of the various mills which will supply the pipe. This evidence should be made available to the public at this time.

p. 2-16; Section 2.2.2 Pipeline Construction

79-3 The construction phase of a project of this magnitude can be its most dangerous phase, e.g. construction incidents involving personal injury as well as the possible release of gasoline, diesel fuel or other hazardous substances. The report does not mention a Spill Prevention, Control, Countermeasures Plan (SPCC Plan) for the construction phase.

(see comment re: p. 4-52).

RESPONSE TO LETTER 79

79-1 The systems relating to monitoring of pipeline operation and conducting proper shut-down procedures in the case of an emergency will be protected by auxilliary communications and power supply. Please refer to the response to Comment 69-5 and Mitigation Measure SS-6.

Regarding the analysis of utility corridors, please refer to the response to Comment 72-16.

79-2 Details on AAPL's internal quality control and inspection procedures are provided on page 2-12 in the Draft SEIS. Also, please refer to the Modifications and Corrections section in the Final SEIS for page 4-8.

79-3 Please refer to the Modifications and Corrections section for page 4-8 regarding the impact of construction-related oil spills.

LETTER 79

p. 2-19; Section 2.2.2.1 Preconstruction Activity

"The All American Pipeline would be a common carrier for crude oil."

79-4 The DSEIS discussion is limited to a few crude oils which could possibly be carried by the pipeline. There is no assurance that other hazardous materials or hazardous substances will not be carried. If there is any possibility that other materials will be carried by this pipeline, the discussion should include the names, properties, corrosion characteristics, SPCC plans, etc.

p. 2-20; Section 2.2.2.2 Clearing and Grading the ROW

"Pipe burial depth of 36 inches would be measured from the natural ground surface to the top of the pipe."

79-5 It is not clear whether the "natural ground surface" is determined before, or after initial grading and burial of the pipe.

p. 2-23; Section 2.2.2.5 Pipe Bending, Laying, and Welding

"At a minimum, ten percent of the welds made by each welder each day would be radiographically inspected."

79-6 The DSEIS does not indicate the number of welds a welder can make in a day. Can more than one welder work on the same weld? The discussion should include mention of reasons needed to radiograph more than ten percent of the welds made by a particular welder. The discussion does not include mention of the credentials of the welders, the persons who take the radiograph, nor the persons who read the radiographs.

p. 2-23; Section 2.2.2.8 Backfilling

"Where necessary, the backfilled earth would be compacted to avoid later settling. In certain areas where damage might occur to the pipe coating, protection would be provided by padding the ditch with clean sand or earth backfill."

79-7 The report does not define the criteria under which these extraordinary actions might be taken. Additional description of the "certain areas" as well as criteria regarding the need for compaction or padding should be established and presented in the report.

RESPONSE TO LETTER 79

79-4 Please refer to the Modifications and Corrections section for page 2-1.

79-5 The language in the text has been clarified to state that the 36-inch clearance be after grading. Please refer to the Modifications and Corrections section for page 22-2.

79-6 Please refer to Mitigation Measure SS-8 in Appendix A.

79-7 Please refer to the Modifications and Corrections section for page 2-23 for more specific information.

LETTER 79

p. 2-29; Section 2.2.2.11.3 Aquifer Crossings (specific to the Edwards Aquifer)

"o Pipe cover would be increased to 48 inches where possible, blasting would not be required as a condition to provide 48 inches of cover. The cover would be at least 36 inches."

79-8 Since the actual amount of cover is unknown at this time, it is unclear how the spill correction factor of 0.728 was determined.

(see comment re: p. A-4)

"o Multiple leak detection techniques would be installed."

79-9 If this statement includes the utilization of computer software, then a better word should be employed, or utilized, rather than installed, which implies that some hardware will be installed at, or adjacent to, the entire pipeline.

"o Comprehensive general liability insurance...provided during the operational life of the pipeline."

79-10 The DSEIS does not indicate that there is comprehensive general liability insurance during the construction and abandonment phases. What is the general liability of All American during the construction and abandonment phases?

p. 2-31; Section 2.2.4 Operation/Maintenance

"The operator would implement established procedures to locate the leak and notify appropriate authorities."

79-11 The report provides no description of "established procedures" nor does it list "appropriate authorities." This information should be published in the DSEIS so that the public is aware of the procedures, and so that the "appropriate authorities" know who they are.

"The pipeline communications system and a backup system would ensure..."

79-12 It is assumed that the phrase, "backup system", means a backup communications system. The discussion doe not mention a backup power system for the main control center. Is there to be a backup power system for the main control center?

RESPONSE TO LETTER 79

79-8 Please refer to page A-4 in Appendix A of the Draft SEIS for this information.

79-9 Your comment regarding this issue is noted.

79-10 AAPL's parent company, Goodyear Tire and Rubber Company, carries comprehensive general liability insurance in excess of $20 million. It is also Goodyear's policy to carry insurance for all activities past and present.

79-11 Please refer to the preliminary Oil Spill Contingency Plan in Appendix B of the Draft SEIS for this information. A list of contacts for appropriate State of Texas agencies, including phone numbers, is provided on pages B-11 and B-12 of the Draft SEIS.

79-12 Please refer to the response to Comment 69-5 and Mitigation Measure SS-6 for a discussion of the backup power and communications system.

LETTER 79

p. 2-32; Section 2.2.4 Operation/Maintenance

"The station controls would be designed for unattended fail-safe operation."

79-13 The DSEIS does not mention which operational parameters and environmental conditions will be remotely accessed from the main control center. Since there are no gas detectors in the pump/heater stations, the possibility of a natural gas leak will go undetected.

(see comment re: p. B-64)

p. 2-33; Section 2.2.4 Operation/Maintenance

79-14 "Pipeline block valves would be fenced with pipe fences and locked gates."

There is no mention of similar security measures for the pump/heater stations.

p. 3-93; Section 3.2.12.5 Public Services

"Water,...police, health...services are adequately provided to the existing populations...

"Emergency response...volunteer fire departments which would respond..."

79-15 These statements indicate that the various community services are available and adequate for the existing population. There is no indication that the various communities have the resources to provide All American normal or emergency support during either the construction phase or the operational phase. Are the emergency response personnel (fire, medical, police) trained and equipped to respond to all emergency needs of the pipeline? If not adequately trained, will All American provide suitable training? Will emergency response personnel have access to the pump/heater stations, the block valves, or the pipeline ROW?

79-16 Additionally, there is no mention of utilization of local emergency response personnel during normal conditions, e.g. will local police be needed to control traffic at construction sites during rush hour? If so, can the local police handle the increased workload?

(see comments re: pp. B-65, B-66)

RESPONSE TO LETTER 79

79-13 The potential impacts of an explosion or fire at a pump/heater station have been mitigated by requiring their location at least 0.5 mile away from residences or public buildings. Please refer to Mitigation Measure SS-9 in Appendix A.

79-14 Please refer to page 4-10 of the Draft SEIS for this information.

79-15 Please refer to the Modifications and Corrections section for page 4-5 regarding the issue of local fire department response to a pipeline emergency.

79-16 Section 2.2.2 of the Draft SEIS describes pipeline construction activity and numbers of pipeline workers. Pipeline construction would not typically require additional traffic control, since each spread is made up of several units performing separate functions at separate locations. Staging areas would be minimal, usually at the contractor's yard, if required. Equipment would be parked in the ROW. Fire protection measures would be implemented by AAPL, when necessary, as described in Section 2.2.2. Pipeline operations would require no additional public service personnel.

LETTER 79

p. 3-95; Section 3.2.12.5 Public Services, Table 3-27 (Revised)

79-17

Table 3-27 indicates that all fire stations have adequate equipment. The term, "adequate," as used by the Commission of Fire Protection Personnel Standards and Education is not defined. How will it be determined if these fire departments possess equipment adequate for protection of the pipeline, and protection of the local population from the pipeline? Table 3-27 also indicates that several fire departments do not provide ambulance services. The adequacy of ambulance service should be discussed. Also, the information in the table is misleading and incorrect; the "within proximity" is not always the closest station:

Pump/Heater Station		Fire Station(s) Within Proximity	Route	Approx. Dist (miles)
Sonora	(Sheet 2)	Odessa *	N/P/S	150
Mountain Home	(Sheet 4)	Fredericksburg	P	25
Seguin	(Sheet 5)	Austin	P	20
		Lockhart	P	6
		Seguin	P	30
Sheridan	(Sheet 7)	Houston *	N/P/S	60

* San Angelo (indicated for the northern route) is only 37 miles from Sonora, much closer than Odessa. Houston is not the closest station to Sheridan.

p. 4-4; Section 4.2.1.2.1 Pipeline Design.

"Internal corrosion prevention...by monitoring and control of...water...and hydrogen sulfide..."

79-18

The DSEIS provides no indication of how, when, where, or how often the monitoring and control would occur.

p. 4-5; Section 4.2.1.2.1 Pipeline Design.

"A fire involving a crude oil spill is not believed to be significant because the high flash point typical of crude oils make ignition unlikely."

79-19

The report fails to recognize that the crude oils involved in this case will be "heated" and that their vapors are significantly more liable to ignition than "cold" crude oils. Additionally, the report fails to recognize the fire potential of the natural gas involved as fuel for the heaters.

p. 4-6; Section 4.2.1.2.1 Pipeline Design.

"This response time in the Edwards Aquifer recharge zone is about 3 times faster than elsewhere on the pipeline."

79-20

The reviewer is unable to determine the response time for "elsewhere" on the pipeline; therefore the reviewer is unable to determine the response time for the Edwards Aquifer recharge zone.

RESPONSE TO LETTER 79

79-17 Based on your comment, Table 3-27 has been revised in the Modifications and Corrections section to provide a more detailed description of fire protection and ambulance protection within proximity of the pipeline pump/heater stations. Oil fires will be handled by the AAPL Emergency Response Team. They will bring the necessary equipment. The local fire departments will be asked to keep surrounding areas such as rangeland from burning. They generally have mutual aid agreements with surrounding fire departments to aid in fighting larger fires.

79-18 Please refer to the Modifications and Corrections section for page 4-4.

79-19 Please refer to the Modifications and Corrections section for page 4-5.

79-20 The detection time of the proposed leak detection system has been updated. Please refer to revised Table 4-2 in Modifications and Corrections Section 3.2.

LETTER 79

p. 4-8; Section 4.2.1.2.2 Quality Control and Testing.

"The pipe manufacturing company is generally responsible for these inspections."

79-21 This statement is too vague. Specific measures for compliance assurance should be addressed. There is no indication that the pipe manufacturing company will require their vendors to possess quality assurance programs, nor is there any indication that the pipe manufacturing company will "inspect" any of their vendors to be certain that furnished materials meet contractural requirements.

p. 4-8; Section 4.2.1.2.2 Quality Control and Testing.

"Costs of repairing or replacing pipe damaged during transportation would be borne by the transporter."

79-22 There is no indication that All American, or their agent, will perform acceptance inspection(s) of pipe when the pipe arrives onsite. Additionally, there is a definite conflict of interest on behalf of the transporter -- since the transporter will bear the cost of transportation damage to the pipe, it is not in their (the transporter's) best interest to report such damage.

p. 4-26; Section 4.2.2.2 Construction (Groundwater).
p. 4-35; Section 4.2.3.2 Construction (Surface Water).

79-23 These sections discuss the impact of construction upon Groundwater and Surface Water, respectively. A construction project of this magnitude will certainly have its share of construction incidents. The discussion should include the impact of construction incidents involving the release of any hazardous substances, e.g. anti-freeze solutions (used as corrosion inhibitors in engine cooling water systems) or other hazardous materials which may be found at a construction site. The discussion should not be limited to fuels and lubricants. (see following comment)

p. 4-52; Section 4.2.6.2. Construction (Aquatic Biology).

"However, the risk would be considered low due to the small volume of fuel used (less than 40 gallons) and low probabilities."

79-24 Although construction equipment may have fuel tanks of approximately 40 gallons capacity, the larger "re-fueling tankers" may have a capacity of several hundred gallons of gasoline and/or diesel fuel. Additionally, a review of oil spill data (USCG oil spill statistics) reveals that many oil spills occur during transfer operations; this aspect of spills is not discussed in the report. Further, the discussion fails to acknowledge that large over-the-road trucks, such as those which may be delivering pipe, have fuel capacities of several hundred gallons. The unprotected fuel tanks of these vehicles are prone to rupture during accidents.

p. 4-98; Section 4.2.12.2 Construction (Socioeconomics).

RESPONSE TO LETTER 79

79-21 AAPL's quality assurance programs are described on page 2-12 of the Draft SEIS. Also, please refer to the Modifications and Corrections section in the Final SEIS for page 4-8.

79-22 Please refer to the response to Comment 79-21.

79-23 Your comment regarding construction impacts is noted; please refer to the Modifications and Corrections section for page 4-8.

79-24 Additional detail on this topic has been provided. Please refer to the Modifications and Corrections section for page 4-8.

LETTER 79

"The total non-local population would not cause...demand greater than 25 percent of...police, medical facilities, fire,...services."

(see comment re: p. 4-103).

p. 4-100; Section 4.2.12.3 Operation (Socioeconomics)

"The occurrence of an oil spill...significant impact...affected local water supply or...in waterways...dependent on the tourist industry."

79-25 The report limits socioeconomic impact to oil spills. Citizens of the local communities will see the oil, hear the bang, or see the smoke FIRST, and they will be the first responders. The report neglects to consider the impact upon local communities for police, fire, and medical first responder services. Proper response to pipeline emergencies (real, or false) will require highly trained and properly equipped personnel. There is no mention of the particular training required and no mention of the particular equipment required; furthermore, there is no indication who will pay for the training and new equipment.

(see comment re: p. B-65)

p. 4-103; Section 4.2.13.2 Construction (Transportation)

"Typically, a maximum of 335 workers would access the ROW at a single point. At a few locations, an additional 20...or 50...(never both) could arrive by the same access route for a maximum of 385 worker trips at a single point."

79-26 The report neglects to consider that delivery vehicles, e.g. carrying pipe, as well as "snack wagons," etc., will congregate at site entrances. Most certainly, at some of the site entrances, there will be sufficient congestion to warrant traffic control services of local police. It is difficult to imagine that the demand (extra officers, overtime for Saturday?) upon the local police force(s) will increase no more than 25 percent.

p. 4-175: Section 4.7.1 System Safety and Reliability

"Measure SS-3: ... Additional mitigation measures may be developed where noncompliance is determined."

79-27a The "may" in this statement leads the reviewer to believe that the results of any independent review may mean nothing - All American management may institute additional mitigation measures, but there is no guarantee that this will be done. There is an indication that the independent reviews may be nothing more than exercises in futility.

2-387

RESPONSE TO LETTER 79

79-25 Additional information on local fire department response is provided in Modifications and Corrections section for page 4-5.

79-26 Your comment has been noted. However, it is our conclusion that construction activities would not cause traffic congestion problems which would require additional permanent police personnel.

79-27a Please refer to revised Mitigation Measure SS-3 in Appendix A.

LETTER 79

p. 4-182; Section 4.7.6 Aquatic Biology

79-27b "Measure AB-1: Fueling and lubrication of construction equipment will occur within 0.25 miles of water bodies."

Should this read, "...will not occur within 0.25 miles..."?

"Equipment will be periodically checked for leakage to avoid spills."

79-28 The phrase "periodically checked" is not definitive. Does this mean that equipment will be checked once a week? Additionally, the DSEIS does not discuss the security of fuel supplies during the construction phase. Stealing fuel and "malicious mischief" is noted to occur at construction sites, and these events may lead to spills of fuel and lubricants.

p. 4-184; Section 4.7.7 Terrestrial Biology

"Measure TB-5: ...these booms would be used to prevent oil from entering..."

79-29 When using the word "prevent" the report does not adequately consider the ineffectiveness of oil spill booms when deployed in flowing water.

p. 4-193: Section 4.7.12 Socioeconomics

"No socioeconomics mitigation measures are required for the Proposed route... "

(see comments re: pp. 4-98 and 4-100)

p. 4-193: Section 4.7.13 Transportation

"No transportation mitigation measures are required for the Proposed route... "

79-30 The report fails to consider damage to local roads caused by very heavy construction equipment and trucks, e.g., those which will be delivering the pipe. Unimproved roads will be damaged and dirt roads will be "wash boarded" by the unusually large vehicles and heavy vehicular traffic. There is no indication that All American will repair, or provide compensation for, any damage to these roadways.

(see comment re: p. 4-103).

p. 4-197: Table 4-63, Impact Summary for the Proposed Route

The table indicates that there is no System Safety and Reliability impact during construction.

(see comments re: pp. 4-52 and 4-100).

RESPONSE TO LETTER 79

79-27b Please refer to revised Mitigation Measure AB-1 in Appendix A.

79-28 The frequency of inspections is at the discretion of the BLM's Authorized Officer at the construction site.

79-29 The deployment decision for booms will be made in the field based on evaluation of on-site conditions. The comment is correct in noting that booms are not effective in rapidly flowing streams.

79-30 Please refer to the response to Comment 56-125 and Mitigation Measure T-1.

LETTER 79

p. A-3; Section 2.1 Spill Frequency Correction Factors

79-31 "Internal Corrosion Pipeline will be monitored at the inlet to minimize water and H2S content."

(see comment re: p. 4-4)

p. A-4; Section 2.1 Spill Frequency Correction Factors

"Outside Forces ...Deeper burial means..."

79-32 The DSEIS does not quantify "deeper." Lacking quantitative information, the reviewer is unable to verify that the spill correction factor is 0.728.

(see comment re: p. 2-29)

p. B-1; Section 1.1 Purpose

"...This plan has been prepared to assist the operator's personnel and contractors..."

79-33 The report does not discuss the methods of selecting various spill response contractors. What will be the selection criteria? The report should indicate this information so that the public can be assured that the best response to an oil spill is made available.

p. B-6; Section 2.2.1 Management

"...All American management will designate an Oil Spill Coordinator..."

79-34 There is no indication that the Oil Spill Coordinator will be suitably trained, and have the qualifications befitting this most important position.

p. B-6; Section 2.2.2 Operations

"The Pipeline Dispatcher may initiate the OSCP if he detects a spill..."

79-35 There is no stated, definitive criteria to guide the Pipeline Dispatcher in his duties, nor does the public know when the OSCP will be initiated.

p. B-11; Table B2-2 SUGGESTED STATE AGENCY CONTACTS

79-36 The report does not contain provisions that All American will update this listing, especially phone numbers. How often will the names and phone numbers be verified?

2-389

RESPONSE TO LETTER 79

79-31 Please refer to the Modifications and Corrections section for page 4-4.

79-32 Please refer to Appendix A, page A-4 of the Draft SEIS.

79-33 AAPL will use the following criteria, as a minimum, for its selection of oil spill cleanup contractors:

a) Has a minimum 10 years experience, collectively;

b) Can demonstrate ability to respond to a given spill site in the time alloted as described in the Oil Spill Contingency Plan;

c) Has adequate in-house mobil spill equipment, such as 6-inch and 12-inch river boom; sorbent material, skimmers, appropriate sized boats/motors, etc.; and

d) Has a good record for response and cleanup activities as stated by previous and/or current clients and/or pertinent government agencies.

79-34 AAPL has committed to having a qualified staff person fill this position. Please refer to page B-8 of the Draft SEIS for a description of the training procedures for emergency response personnel.

79-35 The pipeline dispatcher would receive first notification of a spill which is detected by the supervisory control system. In this case, it is his/her responsibility to initiate the Oil Spill Contingency Plan. Additional detail is provided in the Modifications and Corrections section for page B-15.

79-36 The Oil Spill Contingency Plan will be updated annually. Names and phone numbers of agency contacts are to be verified at this time.

LETTER 79

p. B-14; Section 2.4 Communications

"If a major oil spill..."

79-37 The criteria for a "major" oil spill are not defined.

p. B-15; Section 2.5 Immediate Response Procedures

"All American Pipeline Company has recently requested the services of the Texas One Call System ... It is not known at this time whether this system is available for the entire length of the proposed pipeline route..."

79-38 That All American lacks specific knowledge of the Texas One Call System(s) is very disturbing.

p. B-31; Section 3.1.4 Booms

"..., or when the water current is too fast for containment booming."

79-39 The report does not provide criteria for these decisions. At what water current does containment booming become ineffective? Who will make the decision to initiate action other than containment booming?

p. B-36; Figure B3-11. Cross Sections of 3 High-stability boom(s)

79-40 The information depicted in this figure is somewhat incomplete and misleading. Is the containment effectiveness of each boom-type the same? Which boom-type will be employed by All American? What is the depth of the skirt on each of the boom-types? What happens if the stream depth is less than the skirt depth?

p. B-40; Section 3.2 Oil Cleanup Techniques

"Cleanup techniques discussed are: ... Soil removal."

79-41 The listing of various cleanup techniques fails to consider the "no action" alternative. In some cases involving oil spill cleanup activities, the damage incurred by heavy equipment, people, etc., may exceed the damage caused by the spilled oil. An alternative in cases such as this is NO ACTION.

p. B-41; Section 3.2 Oil Cleanup Techniques

"Dispersants would not be used for cleanup of spilled oil. EPA does not allow the use of dispersants for oil cleanup in the United States."

79-42 The EPA does allow the use of approved dispersants in certain cases, re: Natl Contingency Plan, Subpart H, 40 CFR 300.

RESPONSE TO LETTER 79

79-37 In practice, most companies define a major oil spill as one which requires reporting to the regulatory agencies (see Section 2.6 of Appendix B of the Draft SEIS). However, the distinction on whether a spill is minor or major is an operational one for which no specific criteria exist. However, AAPL has committed to provide action to detect, locate, and cleanup all spills from their pipeline, regardless of the volume of oil lost.

79-38 Your comment is noted. AAPL will subscribe to the Texas One-Call System.

79-39 Please refer to the Modifications and Corrections section for page B-31.

79-40 The level of detail requested by your comment is not available at this time.

79-41 The text has been modified to include the alternative of No Action for cleanup. Please refer to the Modifications and Corrections section for page B-51. However, note that the No Action choice is a last resort and is only employed when it is expected that cleanup would damage the environment more than the spilled oil.

79-42 The text has been modified to incorporate the suggested change. Please refer to the Modifications and Corrections section for page B-41.

LETTER 79

p. B-64; Section 5.2 Fire Protection System

"The proposed pipeline facilities would be equipped with the following systems: smoke detectors, fire sensors, fire extinguishers."

79-43 There is no mention of instruments to detect leaking natural gas.

(see comment re: p. 2-32)

p. B-65; Section 5.4 Fire Fighting Training

"Fire fighting training..."

79-44 There is no indication that All American will verify and/or provide suitable fire fighter training to local fire departments who may be included in their mutual assistance plan(s).

(see comment re: p. 3-93)

p. B-65; Section 5.5 Fire Drills

"Fire drills would be conducted not less than twice per year...all parties involved...important for local fire departments..."

79-45 There is no indication that All American will bear the cost of these drills incurred by the local fire departments.

(see comment re: p. 3-93)

p. B-66; Section 5.6 Fire/Emergency Response Procedures

"In the event ... call the local fire department...call the local law enforcement department..."

79-46 It appears the the pump/heater stations will be located behind fences and locked gates. If the local emergency response personnel lack access to these areas, their response may be meaningless.

(see comments re: p. 3-93, B-64, B-65)

Cece WS1 "TRAVIS5A" 3/25/87

RESPONSE TO LETTER 79

79-43 Please refer to the response to Comment 69-2.

79-44 Please refer to the Modifications and Corrections section for page 4-5. Active participation by the local fire departments in suppressing an oil fire is not anticipated.

79-45 Please refer to the Modifications and Corrections section for pages B-65 and B-66.

79-46 Please refer to the Modifications and Corrections section for page 4-5.

LETTER 80

RECEIVED
1987 MAR 30 PM 12:51

Shell Pipe Line Corporation

R. C. McMahan
President

Two Shell Plaza
P.O. Box 2648
Houston, Texas 77252

March 26, 1987

Mr. William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

ALL-AMERICAN DRAFT ENVIRONMENTAL IMPACT STATEMENT

This will constitute the comment of Shell Pipe Line Corporation (Shell) on the Draft Environmental Impact Statement (DEIS) for the proposed All-American Pipe Line Project. Shell has no ownership interest in the All-American pipeline but believes it is appropriate to comment because the DEIS might have impact on Shell's future pipeline operations.

2-392

In general, Shell believes the DEIS is a well-written, well-organized and well-documented description of the proposed project, its alternatives and their potential effects upon the environment. However, the construction requirements, leak detection specifications and mitigation measures are unduly restrictive or need clarification. Applicable comments follow.

General Comment

80-1 The DEIS states that older pipelines would have a higher frequency of spills than All-American would have. This generalization would not apply to older pipelines that have been well maintained and operated with current technology. Further, third party damage, the major cause of pipeline failures, has no correlation with the age of the pipeline.

Operation

2-31, 2.2.4 Operation Maint. and 4-5, 4.2.1.2.1 Pipeline Design

80-2 These sections describe leak detection sensitivity issues. Our experience as a pipeline operator has not indicated that the stated leak detection sensitivity is achievable even with state of the art technology. Shell is concerned that the applicant's stated leak detection capability would become an unachievable requirement for future pipeline operations.

TNM8707003

RESPONSE TO LETTER 80

80-1 The statements in the Draft SEIS are generalizations based on historical statistics regarding pipeline failures. No attempt has been made to evaluate the engineering design and related oil spill risks of specific existing pipelines. You are correct; most losses are caused by third parties.

80-2 Please refer to revised Table 4-2 in Modifications and Corrections Section 3.2 for updated information on the leak detection system.

LETTER 80

4.7 Mitigation Measures

4-175, SS-3

80-3 This DEIS mitigation measure would require that qualified pipeline engineers subject the final pipeline design, operating procedures and supporting documentation to an independent analysis and review. The DEIS does not address the criteria that would be used to select qualified pipeline engineers, does not set out any procedure for the process and does not indicate whether the applicant will be involved in the review. Without regard to those significant deficiencies, the requirement is unprecedented, unnecessary and unworkable. We offer the following observations in support of these objections:

1. As far as we know, this is a new and unprecedented requirement, and experience has demonstrated that it is not needed. Numerous other cross country pipelines requiring compliance with NEPA and the individual state environmental laws have been successfully completed without the independent review and analysis "to confirm that the applicant's intention to build and operate a safe pipeline is satisfied".

2. There is no documentation to suggest that the applicant will not comply with applicable design criteria and safety regulations. Further, there is no documentation to indicate that the applicant does not have qualified and experienced engineers.

4-177, SS-5

80-4 The DEIS does not provide adequate justification or cost/benefit for the requirement to install electric motors on all manual block valves. Specifically, it does not take into consideration the remote locations of some of these valves and does not evaluate the environmental consequences of installing power lines to all remote valve locations.

4-185, TB-6

80-5 The DEIS does not address land use or safety issues associated with the requirement that the working side of the applicant's right of way overlap existing right of ways where existing pipelines are paralleled. Although this requirement may be justifiable or at least understandable across endangered species habitat, it can create overriding negative consequences in many locations. For example, safety may be diminished during construction activities and subsequent maintenance operations because it will require that heavy machinery and equipment work over

RESPONSE TO LETTER 80

80-3 Please refer to the response to Comment 6-15 for a discussion on the selection of an independent reviewer. A similar mitigation measure was written for the California to McCamey segment of the All American Pipeline; the BLM and DOT are the reviewers.

80-4 We have modified this measure; please refer to the revised Mitigation Measure SS-5 in Appendix A.

80-5 Mitigation Measure TB-6 was intended for the Authorized Officer to minimize disturbance to new areas by using adjacent ROW such as was completed in Arizona and New Mexico along the El Paso Natural Gas Line. The officer would ensure that safety and damage considerations to the existing line were not compromised. This measure is a compromise between the various companies wishing complete independence and private land owners wishing to consolidate and minimize disturbance on their properties.

LETTER 80

and in close proximity to operating pipelines. In addition, this requirement does not take into consideration the plans and concerns of the owner of the existing rights of way, the landowner, other regulatory agencies or orderly land development and usage.

4-185, TB-4; 4-185, TB-8; 4-186, TB-10; 4-187, TB-11

80-6 The mitigation measures recommended above would restrict construction activities across each of the endangered species habitats to certain times of the year or to a certain distance from nests or breeding areas. This requirement is also unreasonable, unnecessary, and lacking in sufficient data to support the DEIS recommendations. If all of the above species occur, construction prohibitions will be in effect on certain areas of the right of way from February 1 through October 15, leaving a three and one-half month period during the wet period of the year for construction.

80-7 Alternative mitigation measures could be implemented to minimize these construction restrictions, such as reduction of right of way width across nesting, brooding or breeding areas, minor route adjustments to avoid black-capped vireas nests, habitat restoration, or habitat enhancement.

80-8 The DEIS does not present data to support its recommendation that construction activities should not occur within 0.5 miles of active raptor nests (TB-4); one mile of Attiwater's prairie chicken active leks or brooding populations (TB-10) and two miles of active bald eagle nests (TB-8) or state how close construction activities can be conducted to existing black-capped vireas active nests or breeding areas (TB-11).

4-189, CR-1

80-9 The DEIS does not adequately address why it is necessary to conduct cultural resource surveys on a 200-foot corridor for the applicant's proposed 100-foot-wide construction right of way or whether the U.S. Corps of Engineers requirement for a 100% inventory within its permit area will include agricultural and industrialized areas and private lands. Many of the cultural review programs incorporated in other EIS's have demonstrated that cultural resources can be adequately protected by surveying corridors 100 feet wide or less, and by eliminating field surveys across those areas that are known to have a low potential for significant cultural resources.

Yours very truly,

Robert H McMahon

PEW/amw/kl

TNM8707003

RESPONSE TO LETTER 80

80-6 Your comment regarding this issue is noted. The approach of construction timing limitations or minor route changes to avoid impacts to endangered or other specially-classified species is a standard procedure under NEPA and the Endangered Species Act. The USFWS is the primary decision-making agency and will determine the final measures. Some of the mitigation measures have been modified to reflect new data from surveys this spring. Also, the extensiveness of the avoidance locations is generally quite small. Such measures allow for additional site-specific data collection activities and the fine tuning of the ROW centerline, construction schedules, and construction contractor planning. In addition, such measures would involve direct coordination with an agency representative who, typically, has the authority to achieve some flexibility in the implementation of the measures depending on local conditions or other special circumstances.

Based on findings this spring, totally closed periods for construction are unlikely. The black-capped vireo is the only species that we are unsure of at this time. See the modified Mitigation Measures TB-4, TB-8, TB-10, and TB-11 in Appendix A of the Final SEIS. TB-4 was implemented west of McCamey with no adverse problems to raptors or construction.

80-7 Your comment concerning this issue is noted. Alternative approaches may be appropriate under some circumstances. The BLM Authorized Officer, as specified in the Final SEIS, will have the authority to allow alternative mitigation in conjunction with consultation and approval of the appropriate resource agencies.

80-8 Thank you for commenting. Please refer to the responses to Comments 80-6 and 80-7. The distance limitations for construction activities near known sensitive areas were derived from a number of sources including agency recommendations, information from species experts, and previous NEPA and Biological Assessment precedents. Mitigation Measure TB-4 was required in the first AAPL ROW grant. Attwater's greater prairie chicken recommendations are being prepared by the USFWS and TPWD. USFWS has a number of historical rulings considering bald eagle mitigation. Specific recommendations for the black-capped vireo are being developed in conjunction with site-specific data collection and USFWS.

80-9 Many archaeological properties are in fact quite large and can easily exceed the proposed 100-ft construction zone. Additionally, it is our experience that contractors for the pipeline company routinely request wider construction access for the purpose of negotiating side slopes, stream crossings, etc. The 200-ft survey corridor is a simple and cost-effective mechanism to ensure the acquisition of data adequate to address the potential for site avoidance. Where information is available indicating that low potential for significant cultural resources exist, such as on some agricultural and industrialized lands, coordination among the affected parties can take place to ensure that no unnecessary work is required.

LETTER 81

TOM GREEN COUNTY

SAN ANGELO, TEXAS

OFFICE OF

March 12, 1987

To the Bureau of Land Management:

In regard to the All-American Pipeline, and it's apparent intention to use the northern route through Texas, we respectfully submit the following recommendation.

2-395

81-1 The proposed line on the map goes just north of Christoval, Texas and south of FM Road 2335 which brings it through a heavily populated area of small tracts each having a water well that could be affected. If the route was to go just five miles to the north and cross FM 2335 and then to go east to cross Highway #277, most of the concerns of the citizens in that area would be met.

81-2 This does not preclude the need for strict guidelines to protect surface and underground water from contamination and constant inspection by the proper authorities.

Respectfully,

Dave Ryan

Dave Ryan
County Commissioner
Prct. 4
San Angelo, Texas
76903

RESPONSE TO LETTER 81

81-1 Your concern regarding conflicts of the Northern Alternative with groundwater wells north of Christoval is noted. Please refer to Mitigation Measures GW-1 and GW-3 in Appendix A.

81-2 Your comment regarding the need for strict guidelines to protect surface and underground water from contamination is noted. We agree with your comment. Please refer to Mitigation Measures GW-1 through GW-3 in Appendix A.

LETTER 82

RECEIVED
1987 MAR 30 PM 12:54

William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh,

I wish to add to my comments presented to the Bureau of Land Management at the one o'clock hearing on March 2, 1987, in Austin, Texas.

82-1 The projection for the number of spills is based on a forty year life of the pipeline. Is there a requirement that forty years after the completion of the pipeline, it is shut off? If the pipeline itself is weakened by then and is not shut off, what is the potential hazard then? I propose that criteria be established to determine the end of the life of the pipeline, and the administrative procedures to ensure it is shut down.

Has the BLM considered a worst case for the economics of the pipeline? What if some of the following occurred:

82-2

a. Oil prices stabilize at a level that minimizes the profit margin of the pipeline.

b. The refineries on the Texas coast are damaged by hurricane, deterioration, human error, or become economically inoperable due to air pollution control legislation.

c. Goodyear, the parent company, divests itself of Celeron to reduce debt and liability, thereby reducing Celeron's financial base.

d. One or more of the projected eight spills occurs and damage and reclamation costs are higher than Celeron may want to pay.

82-3 What guarantees for protection does the State have that Celeron will not walk away, declare bankruptcy and then leave the taxpayers with the burden of clean-up? Shouldn't Celeron be bonded, not just insured, but bonded for a substantial amount? Can a superfund be created to build up monies to provide for such circumstances?

In Appendix B, Section 3.2.11, Soil Removal, Page B-52, a sentence reads:

"Impoundment of hydraulic-dredging slurry provides the only economically reasonable method of replacing large volumes of soil."

Cont'd.

RESPONSE TO LETTER 82

82-1 The 40-year project life is an estimated operating life based on the industry's experience with pipelines of this size. The pipeline could be operated for a longer or a shorter period based on a number of conditions. AAPL would continuously evaluate economic conditions including demand for the pipeline, pipeline tariffs, operating costs, and maintenance costs to determine when operations should be terminated. There is currently no administrative procedure by which a pipeline company can be forced to shutdown and abandon a pipeline. Please refer to Appendix A of the Draft SEIS.

82-2 We have answered your multi-facetted question concerning economics as follows. Item a) pipelines are generally less expensive for long-term oil transport in comparison to tankers. Old tankers must be replaced by newer tankers at some future cost; and tankering is more labor-intensive; labor scales will increase. Thus, in the long-term, future pipelines are cheaper than the tankers. Item b) over a quarter of the U.S. refineries are located near the Texas coast. It is unlikely that these refineries will be allowed to deteriorate beyond their ability to process crude oil. Also, the primary demand for petroleum products is in the eastern U.S. The west coast oil is a surplus and if refined in PADD 5, it would require transport to the markets in the east. Item c) Celeron Pipeline Company has substantial assets of its own and thus combined with its parent company would have suitable resources to insure the project (see Comment 18-2). Item d) the United States Superfund Legislation assures that oil spill contamination will be cleaned up to a satisfactory level under the supervision of the on-scene coordinator and the EPA, and the responsible party will pay for such costs.

82-3 In the case of default, CERCLA funds (or Superfund) can be petitioned for cleanup of such a spill. However, in most cases, the responsible party with substantial assets may have to liquidate to pay for the cleanup (refer to response to Comment 18-2).

LETTER 82

82-4 I admit that I do not know what hydraulic-dreding slurry is, but I question its suitability to replace substrata equally well across 486 miles of Texas terrain. If it differs in ph or texture significantly from the surrounding substrata, its use would not lead to satisfactory restoration, just replacement that could result in the degradation of the land.

82-5 I object also to the use of the phrase "economically reasonable" Reasonable to whom: the landowner whose land is polluted or the Board of Directors of the parent company? I think the BLM should define more specifically the issue of restoration and reclamation. It should not be the burden of the citizen to have to go to court to resolve these issues. It is the role of the government agency overseeing this project to see that the people are protected.

82-6 I hope that the mapping errors that were pointed out at the hearing will be strenously looked into, particularly for Fort Bend County where the route is bound to cross.

82-7 At the hearing, I spoke specifically about the hazard of crossing a lignite stripmine by the pressurized pipeline. Specific data about Shell's proposed mine are available at the Texas Public Utility Commission in Docket Number 3838 and 3896 combined.

Thank you for the opportunity to address the issues raised in this Supplemental Environmental Impact Statement.

Sincerely yours,

Linda Lewis Williams

Linda Lewis Williams
Route 4, Box 248A
Elgin, Texas 78621

LLW/ks

March 27, 1981

RESPONSE TO LETTER 82

82-4 This reference is for cleanup of soils contaminated by an oil spill. Such activities would not occur for the entire pipeline route and would only cover those areas where no other soil cleanup techniques were feasible.

82-5 Restoration of lands contaminated by oil spills are covered in Appendix B, page B-52 of the Draft SEIS.

82-6 The route identified by AAPL in their application to BLM is on 7.5-minute USGS quadrant maps and will be updated as necessary. The generalized maps in the Draft SEIS were accurate.

82-7 The proposed pipeline alignment will be negotiated with the owner of the mining rights prior to construction activities.

LETTER 83

J. W. HERSHEY
P. O. BOX 13244
HOUSTON, TEXAS 77219

RECEIVED
BUREAU OF LAND MANAGEMENT
1987 MAR 23 AM 11:53
DISTRICT

March 21, 1987

Bureau of Land Management
1695 Spruce St.
Riverside, California 92509

Dear Sirs and Mesdames:

I wish to go on record as being adamantly opposed to the extension of the pipe line being constructed by Celeron (Goodyear). I understand that the project is virtually complete to McCamney.

As an owner of extensive property in Gillespie County, Texas, through which the pipe line is projected to transit, I will oppose it to the fullest extent of the law on the grounds that:

(1) it is environmentally unacceptable, especially en route over the Edwards acquifer;

83-1 (2) it is economically wasteful of resources, as adequate refining capacity is potentially available on the West Coast;

83-2 (3) refining this type of crude oil at Texas City, its proposed terminus, will worsen already bad ambient air in the area.

Sincerely,

J. W. Hershey

RESPONSE TO LETTER 83

83-1 Your comment regarding refining capacities is noted. Please refer to the response to Comment 56-1. Western U.S. crude oil is in excess of the market need on the West Coast; whereas, the eastern U.S. imports oil and could therefore utilize the West Coast surplus.

83-2 Thank you for your comment regarding potential air quality impacts from refining the AAPL crude oil. Please refer to the response to Comment 56-9 and Section 4.2.10.3.2 of the Draft SEIS.

LETTER 84

RECEIVED
1987 MAR 23

OFFICE OF
County Commissioner
Pct. 2

March 20, 1987

Bureau of Land Management
1695 Spruce St.
Riverside, California 92507

Gentlemen:

84-1 The proposed Northern Route of the All American Pipeline may be crossing Pct. 2 in Tom Green County. As Commissioner of Pct. 2, my concern is for the necessary safe guards to be taken in the installation of the pipeline to protect our natural resources.

84-2 With all concerned groups working together, I feel the completion of the pipeline will be achieved. For this reason, I would ask your consideration of lifting the Restraining Order against the Texas Rail Road Commission, as they are the policing agency for our natural resources in the State of Texas.

This small action on your part would further establish your policy of good will. It would also entice all parties concerned to work together for the completion of your project. In situations of this magnitude, we must all keep in mind that this is a world of give and take.

Sincerely,

Mary M. Burk

Mary M. Burk
County Commissioner
Pct. 2

MB/mm

RESPONSE TO LETTER 84

84-1 The BLM shares your concern that adequate safeguards be taken to ensure that the proposed All American Pipeline be constructed and operated such that damage to the environment is minimized. Please refer to Mitigation Measures in Appendix A of the Final SEIS.

84-2 Your comment regarding the role of the TRRC is noted. Please refer to the response to Comment 6-15.

LETTER 85

RECEIVED 3R

THREE MILL RANCH
BRAHMAN & BRAHMOUSIN CATTLE

MIKE LANGE, MGR.
Route 2 Box 131-A
Mountain Home, Texas 78058
512-866-3392

March 27, 1987

TOM SYFAN
Route 1 Box 8
Mountain Home, Texas 78058
512-866-3378

Mr. Bill Haigh
B.L.M.
1695 Spruce Street
Riverside, Calif. 92507

Dear Bill:

After a careful review of the Federal Supplemental Draft Environmental Impact Statement covering the "All American Pipeline Company's" proposal to extend a crude oil transmission pipeline 450 miles from McCamey in West Texas, to the Gulf Coast near Webster, Texas, it is my opinion that the draft supplemental statement is inadequate and incomplete at best. I'm enclosing a list of some sections and page numbers with subjects briefly referred to. In each case I feel that there are serious problems with regard to correctness, completeness,accuracy, contradictions or pure conjecture.

85-1 Section 2 Page 1 Common Carrier - of what,gasoline, diesel, sewage, chemical waste?

85-2 Page 2 Spill size for each product that could be carried/

85-3 Page 3 Spill Probability

Page 5 Documentation and Clarification - what guarantee do we have?

85-4 Page 12 I understand the pipe is foreign made in Europe and South America - Currently in storage in Corpus Christi,Texas?

85-5 Page 20 Detail right of way,fences,clearing,wood,cleaning,leveling, double ditching,trench blasting,ditch cleaning,padding dirt placing pipe,wraping pipe,covering pipe,etc. - what are the assurance's that contractor will comply with terms of the All American Contract.

85-6 Page 24 Define term ("as close as practical"), by who's standards ? Also clarify the terms calculations, assume, correction factor. etc.

85-7 Page 30 Insurance - What does $10,000.000. cover? The Job? A Mile? A Landowner? - A spill could cause that much loss to one landowner. Why should the City of Fredericksburg be one of the entente. - The line doesn't go through Fredericksburg.

85-8 Page 31 Detection methods not detailed- Do we take "E.R.T." word for everything?

85-9 Page 33 Plan would provide information- We need plan before they start construction!

Page 45 Rational, need much more study and justification.

85-10 Section 3 Page 11 Complete study of Edwards Plateau - Rock Hardness,Porosity, permability, etc.

85-11 Page 23 River Channels - Scour Depth - Solid Rock?

RESPONSE TO LETTER 85

85-1 Please refer to the Modifications and Corrections section for page 2-1.

85-2 This information is contained in Sections 4.2.1, 4.3.1, and 4.4.1 of the Draft SEIS.

85-3 Please refer to the response to Comment 85-2.

85-4 Some of the pipe is foreign-made and it is being stored in Corpus Christi. Please refer to the Modifications and Corrections section of the Final SEIS for page 4-8.

85-5 Please refer to Page 1-5 of the Draft SEIS for details on BLM's observational and enforcement functions regarding pipe construction. The BLM Authorized Officer will ensure compliance with all features of the project design. Please refer to Comment 6-15 and Mitigation Measure SS-3 in Appendix A of the Final SEIS.

85-6 An explanation of correction factors applied to the pipeline frequency rates is provided on page 4-13 of the Draft SEIS.

85-7 Please refer to the response to Comment 18-2 and Mitigation Measure SS-11. The $20 million liability policy covers damages resulting from an event from the pipeline during construction, operation, or abandonment at any location along the route. Damages must be directly linked to the AAPL crude oil pipeline. The $10 million liability insurance for the City of Fredericksburg resulted from an agreement between AAPL and the City.

85-8 A synopsis of the leak detection methods is provided on pages 2-31 and 4-5 of the Draft SEIS.

85-9 Engineering will be reviewed; please refer to the response to Comment 85-5.

LETTER 85

85-12 Section 3 Page 26 Geology - Incomplete
85-13 Page 27 Karstic Terrain - Study Incomplete
85-14 Page 46 Oak Wilt - Study area of Infection
85-15 Page 47 Exotic Game - Effect?
85-16 Page 75 Air Polution
85-17 Page 81 Intratex Gas Line - 50 feet or closer ?
85-18 Page 84 Sonora Caverns - Blasting effects other damage
85-19 Page 84 Spill Effects on summer camps, Hunting, fishing, sight-seeing caving, swimming, picnicing, camping, retirement population
85-20 Page 96 California refiners - up grade - expand?
85-21 Page 100 California Crude "May"exceed California refineries.
85-22 Page 104 Other Pipelines Arco, Texaco, Shell, Chevron, Tankers,"No Project Alternative" seems quite feasable.

85-23 Section 4 Page 2 Need Complete Engineering design before construction starts.
85-24 Page 5 Pressure relief specifications, liquid relief and disposal system specifications.
85-25 Page 5 Fire protection, detection, control plan - equipment
85-26 Page 5 Leak detection
85-27 Page 6 Detail Volumetric Imbalance and Mathmatical modeling techniques
85-28 Page 8 Pipe is in Cropus Christi - now.
85-29 Page 9 Spill Information?
85-30 Page 13 Edwards Plateau - 190 + miles wide Acuifer - where does that water go?
85-31 Page 21 Response time to ranch areas
85-32 Page 23 Update Shell Spill May 27, 1986 near Austin, Texas
85-33 Page 25 Explain Developement of new water sources etc.
85-34 Page 27 Damage from blasting
85-35 Page 29 Need 2 to 10 barrell spill clean up test in several areas with various response times
85-35a Page 30 Need on the ground inspection by E.R.T.
85-36 Page 34 Probabilities - Projections - need facts
85-37 Page 36 Johnson Fork Llano River - solid rock at crossing location
85-38 Page 37 River Velocity
85-39 Page 39 Would oil mix with all the lake or stay on top?
85-40 Page 40 Spill effect on fish and wildlife and vegetation.

85-41 It is disappointing to find that the information published by E.R.T. in this E.I.S. is as general as what can be found in the Texas Almanac and other comparable publications. The critical information, important to the Enviormental study, is presented subject to theories, projections, suppossions, presumptions and incompletions. It appears to me as though an effort was made to justify the acceptance of what All American has done to this point, and then in the summary of respective sections to protect the E.R.T. credability.

We need detailed cause and effect studies on all of the subjects that are pertinant not just a passing mention that various conditions and facts do exist.

Thank you for handling the details of this matter. I know that it has been a burden for you.

Sincerely,

Tom

TS/dl

RESPONSE TO LETTER 85

85-10 Your comment regarding a complete geologic study of the Edwards Plateau is noted. Your comment regarding physical effects of crude oil contamination of the Edwards-Trinity Plateau Aquifer is noted. A detailed survey of groundwater resources of the Edwards Plateau Region was conducted. Please refer to the Modifications and Corrections section for pages 3-8 and 3-114.

85-11 Please refer to Mitigation Measures G-1 and G-2 in Appendix A concerning geotechnical studies.

85-12 Your comment regarding incompleteness of the geologic study is noted; additional localized study of the geology along the pipeline route will be completed during construction, and any appropriate mitigation measures will be taken. Please refer to Mitigation Measures G-1 and G-2 in Appendix A.

85-13 Your comment regarding karstic terrain is noted. Overall, karstic terrain and active karstic processes do not appear to pose a geologic hazard to the pipeline or surface structures. However, local circumstances may indicate a need for additional mitigative measures during construction. Please refer to Mitigation Measures G-1 and G-2 in the Modifications and Corrections section of the Final SEIS.

85-14 Please refer to Mitigation Measure TB-7 in Appendix A. Also see pages 3-46, 3-138, and 3-202 of the Draft SEIS for a discussion of areas potentially affected by oak wilt disease.

85-15 Chapter 3 of the Draft SEIS describes the Affected Environment of the various resources along the alternative pipeline routes. Impacts, or effects, on resources including exotic game are described in Chapter 4. Potential impacts to exotic ungulates are found on page 4-62. See Mitigation Measure LU-3 in Appendix A for reducing potential losses of exotic game.

85-16 Your comment concerning air pollution in the Draft SEIS is noted; please refer to the response to Comment 56-9 for supplemental information and clarification.

85-17 We do not know exactly how close the All American Pipeline will be to the Intratex gas line.

85-18 Your comment concerning the Caverns of Sonora is noted; please refer to Mitigation Measure G-3 in Appendix A.

85-19 Please refer to the response to Comment 53-1 for a discussion of oil spill impacts to recreation resources.

85-20 Please refer to the response to Comment 6-1.

85-21 Your comment regarding the No Project Alternative is noted. Please refer to the response to Comment 56-1 and to the Modifications and Corrections section for pages 2-37 and 4-172.

85-22 The No Project Alternative has been revised; please refer to Modifications and Corrections section for pages 2-37 and 4-172.

85-23 Please refer to Mitigation Measure SS-3 (in Appendix A).

85-24 As explained on page 4-5 of the Draft SEIS, the proposed pressure relief system for the All American Pipeline is safe.

85-25 More detail on fire protection is in the Modifications and Corrections section for page 4-5.

85-26 Please refer to the response to Comment 85-8.

LETTER 85

RESPONSE TO LETTER 85

85-27 Please refer to the response to Comment 85-8.

85-28 Please refer to the response to Comment 85-4.

85-29 Your comment on spill information is noted; refer to the Draft SEIS pages 4-8 through 4-25 and respective discipline impact summaries in Modifications and Corrections, Section 3.4.

85-30 Your comment regarding the direction of groundwater movement in the Edwards Plateau aquifer is noted. Please refer to the response to Comments 66-17 and 66-24.

85-31 Spill response times to sensitive receptors are given in Tables 4-9, 4-39, and 4-51 of the Draft SEIS.

85-32 Please refer to the Modifications and Corrections section for pages 4-23 and 4-29 and to the response to Comment 68-29 for updated information on the Shell Pipeline spill.

85-33 Your comment regarding development of new water sources has been noted. Please refer to the response to Comment 72-27.

85-34 We assume respondent actually means page 4-26 as blasting is not mentioned on page 4-27. Please refer to the response to Comment 6-2 regarding blast design.

85-35 Your comment concerning oil spills is noted; please refer to the response to Comment 18-3.

85-35a The BLM will review the design and conduct various on-ground inspections. Please review Mitigation Measure SS-3 and other mitigation measures in Appendix A of the Final SEIS.

85-36 Your comment concerning accurate probabilities is noted. The SEIS is based on U.S. EPA accepted sources and is specific to large diameter common carrier crude oil pipelines. Some other data bases are available but are not as widely accepted and not as directly applicable. Some of Rose's (1986) statistics include data on oil collection systems from oil fields; these systems are not regulated by DOT and have a higher rate of failure.

85-37 Bedrock is exposed at the surface at the Johnson Fork Llano River crossing. The trench would be excavated using rock trenchers or selective blasting. The pipeline would be coated with concrete and buried 18 inches below the surface of the rock.

85-38 The velocity of a river is dependent upon many factors, including slope, width, depth, and volume of water. Generally, during low flow the velocities of the streams in central Texas range from 0 to 2 feet per second. A velocity of 1.5 feet per second is a conservative estimate during low flow. During flood stage, the velocities can range from 10 to 15 feet per second.

85-39 Please refer to the response to Comment 6-4 for information regarding oil solubility.

85-40 Your comment regarding oil spill effects on fish is noted. Known effects of oil spills are discussed in the Draft SEIS on pages 4-52 through 4-57.

85-41 Your comment regarding impact assessment is noted. Please refer to the Modifications and Corrections Table 2-12 in Section 3.2 and impact summaries by discipline in Section 3.4 of the Final SEIS.

LETTER 86

RECEIVED
BUREAU OF LAND MANAGEMENT
1987 MAR 31 AM 8 25
DISTRICT

Sharon Michaelis
650 MBank Tower
221 West Sixth Street
Austin, Texas 78701

March 30, 1987

William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

FEDERAL EXPRESS

Dear Mr. Haigh:

After reviewing the Draft Supplemental Environmental Impact Statement regarding the Proposed All-American Pipeline Project, I find it to be deficient in many respects. My specific comments appear below and correspond to page numbers of the EIS.

	Page	Comments
86-1	1-6	The EIS refers to BLM's ranking of the top seven issues earning points at the scoping meetings conducted in Texas in August 1986. Numerous Texas landowners living along the Proposed Route signed and submitted a petition to BLM shortly after the scoping meetings were held. This petition stated that the landowners could not rate the issues presented at the scoping meetings because so many were equally important. Consequently, they attached an extensive list of relevant issues to the petition and sent it to BLM in lieu of completing the rating system cards at the scoping meetings. The EIS should elaborate on the concerns raised by these landowners, as they all relate to environmental impact.
86-2	1-7	The EIS refers to "analyses" conducted by All-American Pipeline Company ("AAP") that are relied on in discounting the use of tankers and marine terminals. The EIS needs to address the content of these analysis in order to fully discuss the

RESPONSE TO LETTER 86

86-1 Please refer to the response to Comment 56-17.

86-2 Regarding the No Project Alternative and the use of tankers, please refer to the Modifications and Corrections section for pages 2-37 and 4-172. For discussion of supply and demand, please refer to the response to Comment 56-1.

LETTER 86

William Haigh
March 30, 1987
Page 2

86-2 Cont. necessity of the pipeline as opposed to the alternative of using tankers and marine terminals.

86-3 2-16 The EIS notes that the "typical" cross-country pipeline spread during the construction phase would be a 100 ft. right-of-way, but does not specify the maximum right-of-way that AAP would use during the construction phase. Since a wider right-of-way would presumably increase the environmental impact, the EIS needs to set forth the maximum construction phase right-of-way and the areas in which such a right of way would be needed.

86-4 2-19 The EIS should address where the timber, brush and crops that are cut away will be placed during construction of the pipeline. The accumulation of such materials could have a visual impact on the ROW zone after actual construction has ceased.

86-5 2-20 The EIS notes that AAP would remove trees during the clearing process, but does not specify any size limit on trees to be removed. Since much of the beauty of the Texas Hill Country derives from its many old trees, especially Live Oaks, unfettered discretion in this matter could be devastating. AAP should be prohibited from cutting trees above a certain size as a mitigating measure.

86-6 2-25 The EIS states that "revegetation programs would be based on agency or landowner guidelines," but fails to specify any such guidelines. The EIS needs to address the rights of landowners to demand restoration of the land surface to its pre-construction condition and any limits on such rights, as these affect long-term productivity.

86-7 2-29 The EIS mentions that AAP will use remote-control block valves to stop the flow of oil once a leak has been detected. Since all the oil between the block valves would presumably continue to leak even after the block valves closed, it is important to calculate the volume of oil that would be trapped between block valves once they had closed. This is a major environmental impact.

86-8 2-31 The EIS fails to specify how much time could elapse between detection of a leak and the shutdown of the block valves. Again, oil would continue to leak in

RESPONSE TO LETTER 86

86-3 The ROW width is limited to a maximum of 100 ft except at river crossings and when highways and railroads are bored where additional width is required for equipment staging.

86-4 Please refer to Section 2.2.2.2, page 2-20 of the Draft SEIS for a discussion of disposal procedures. No materials would remain above ground after construction to adversely impact visual quality.

86-5 Your comment regarding old trees along the ROW and potential impacts to visual effects is noted. The construction ROW would be cleared of all above-ground obstacles in order to effectively grade, ditch, and install pipeline along the route. In addition, trees within the ROW would potentially hinder access for accident response and would interfere with the pipeline monitoring program. Please refer to the revised Mitigation Measure TB-1 in Appendix A which addresses construction through sensitive plant and animal communities and habitat. No significant adverse visual impacts were identified in this area, except at the South Llano River crossing.

86-6 Thank you for commenting. Please refer to the newly developed Mitigation Measure S-1 in Appendix A.

86-7 The calculation of pipeline spill volumes at sensitive receptors accounts for this factor. Please refer to the Modifications and Corrections section for page 4-20 for more details on the spill volume calculations.

86-8 Please refer to the Modifications and Corrections section for page 4-16 of the Final SEIS for this information. With regard to the pipeline dispatcher's responsibilities, please refer to the Modifications and Corrections section for page B-15.

LETTER 86

this interim, so that such data is important to an understanding of the impact of an oil spill.

86-8 Cont. The EIS notes that the pipeline dispatcher has discretion to shut down the pipeline, but does not state whether any criteria exist to guide him in this situation. The amount of environmental impact is potentially proportional to the amount of discretion vested in the dispatcher. If, for example, he could allow a 5% leak to continue indefinitely, the impact could be quite significant.

86-9 2-32 The EIS mentions the possibility that remote control of a station may be lost due to a communications failure, but does not specify the effect of such a communications failure on leak detection/pipeline shutdown. This could be a critical area in minimizing the impact of an oil spill.

86-10 2-33 The EIS refers to the pipeline's life span as possibly exceeding forty years, but does not comment on how a more-than-forty year projected life would affect the environmental impact of the project.

86-11 2-34 The EIS notes that "all disturbed areas would be regraded and revegetated where practical," but does not specify who makes the determination of practicality. Regrading and revegetation are important mitigation measures in restoring the surface and enhancing long-term productivity of the land, and the decision to regrade and/or revegetate should be governed by certain guidelines.

86-12 2-37 There is not an adequate discussion of retrofitting of of existing pipeline east of McCamey. Such studies would be important in determining the necessity of the McCamey to Webster segment of the pipeline in light of the alternatives.

86-13 3-15 The EIS needs to address the problem of flooding of channels and streams. Flooding could carry more spilled oil down into the Edwards Aquifer through the recharge zone and could thus have an adverse impact on the water quality in the area.

86-14 3-60 The EIS needs to survey completely the nesting areas of the black-capped vireo, which nests less than

RESPONSE TO LETTER 86

86-9 Please refer to page 2-32 of the Draft SEIS for procedures in the event of a communications failure. Also, Mitigation Measure SS-6 (see Appendix A) provides for a backup communications system.

86-10 As discussed in the response to Comment 82-1, the 40-year project life is an estimate based on industry experience. As the pipeline ages beyond 40 years, the possibility of an oil spill would increase slightly. As shown on page A-3 of Appendix A in the Draft SEIS, spill frequency increases with pipeline age. Mastandrea (1982) shows a constant age correction factor (2.20) from age 36 to 45 years; at age 46, the correction factor increases to 2.80. Thus, a pipeline older than 45 years would be expected to be 27 percent more likely to have a spill than a pipeline 40 years old.

86-11 Your comment is noted; please refer to the newly developed Mitigation Measure S-1 in Appendix A.

86-12 Your comment concerning the No Project Alternative is noted. Please refer to Modifications and Corrections section for pages 2-37 and 4-172.

86-13 The potential damage to the pipeline during flooding and the size of floods are shown in Tables 3-6, 3-41, and 3-60 in the Modifications and Corrections Section 3.2.

86-14 Thank you for commenting. As part of the requirements of the Section 7 consultation process of the Endangered Species Act, a more detailed examination of potential black-capped vireo nesting areas is being conducted. This information will be submitted to the appropriate resource agencies and, if potential conflicts are found, used for design of appropriate mitigation.

LETTER 86

86-14 Cont. kilometer from the Proposed Route. The pipeline could have a major impact on the Vireo's natural habitat.

86-15 3-68 The EIS must consider the impact of pipeline construction on the numerous Indian burial grounds that occur throughout Hays County. A 100 ft.-wide ROW could have a significant impact on these burial grounds.

86-16 3-73 The EIS' assertion that "severe storms such as tornadoes and hurricanes are not very frequent along the Proposed Route" suggests that the area is not very susceptible to water damage. This is not the case. Even moderate rains in this hilly area at any one time of year can cause drastic, rapid damage and flooding, unlike flatter terrain. This flooding can have a direct impact on the amount of oil from any spill that could be carried into the aquifer.

86-17 3-75 Since the NAAQS for ozone was exceeded in 1980 and 1983 in Austin, the EIS needs to address any mitigating measures that would insure that the Seguin pump/heater station will not cause continuing violations of this standard.

86-18 3-81 The EIS asserts that "there are relatively few sensitive land uses in or near the Proposed Route ROW." Our "insensitive" land use equates to 80 lbs. of grain per mature cow per day. Any disruption of this land use would greatly impact our livelihood and decrease the long-term productivity of our land, and should thus be addressed.

86-18a 3-96 There is no substantiation for the second and third assumptions that appear at the top of this page. Since two of the assumptions forming the basis for the proposed project are unsubstantiated, it is impossible to judge the necessity for the proposed project.

86-19 3-100 The EIS needs to address the effect of "higher use" of Texas Gulf Coast refineries regarding air pollution. I understand that the Houston area is already in violation of federal air pollution standards, so that any additional refining activities would seem to have a major, unacceptable

RESPONSE TO LETTER 86

86-15 All parties involved in the project will cooperate in efforts to locate cultural resources which could be impacted by construction, including Indian burial grounds. Such properties will be avoided whenever possible. In the unlikely event that human remains are located which cannot be avoided, treatment will conform to local, state, and federal standards as applicable. Where appropriate, Indian tribes potentially affected by such an action may be consulted.

86-16 Please see Tables 3-6, 3-41, and 3-60 in the Modifications and Corrections Section 3.2 for flood damage potential.

Please refer to the response to Comment 86-41 for effects of flooding and water quality.

86-17 Thank you for commenting. Your concern that the pump/heater station at Seguin will significantly contribute to O_3 formation in Austin is understandable, but unwarranted. Ozone is not emitted directly into the atmosphere but is formed through a series of complex photochemical reactions between air pollutants. One of the principal constituents is NO_x. As discussed in Section 4.2.10.3.1 of the Draft SEIS, the emissions associated with station operation are primarily from combustion of clean burning natural gas. The principal emissions are low levels of NO_x. The predicted maximum annual NO_x impacts were three orders of magnitude below the NAAQS for NO_x at an estimated emission rate of 160 lb/day. This emission rate is low when compared to the average NO_x emission rate of three 1985 model year heavy duty semi-trailer trucks, for example, which is in the range of 250 lbs/day. In addition, because the station is located 20 miles away, even under prevailing winds toward Austin, the trajectory distance is sufficiently long to allow considerable plume dispersion and mixing.

86-18 Long-term productivity of the land would not be significantly affected by the proposed pipeline. Short-term losses would be compensated for by AAPL in the ROW acquisition process. Please refer to the response to Comment 56-1.

86-18a Your comment regarding project need is noted; please refer to the response to Comment 56-1.

86-19 Your comment regarding indirect impacts of refineries is noted; please refer to the response to Comment 56-9.

LETTER 86

86-20 impact. This impact could not be avoided by any of the considered alternatives.

86-21 It is necessary to recalculate the projected California refinery capacity with retrofitting in light of the 150%-160% increase in estimated capability without retrofitting (from 80,000-115,000 BPD in 1984 to 200,000-300,000 BPD in 1986). Retrofitting California refineries could become a more viable alternative, thus eliminating the need for the pipeline. This is especially true since the EIS states that currently proposed pipeline projects exceed the projected need at the present time.

86-22 3-104 The EIS' reference to "the strong environmental laws of California" indicates that these laws might be a deterrent to the option of retrofitting California refineries. If this is the case, why should Texas suffer at the hands of California's strong environmental laws?

86-23 3-107 The EIS states that "[t]he marketplace will ultimately determine the total quantity of oil moved through the All-American Pipeline system." No one disputes that the AAP will have some adverse environmental effects. This being so, is the project necessary at all when there are so many proposed alternative projects and when "the marketplace" for oil is so depressed? This needs to be confronted in the EIS.

86-24 3-127 If the karstic formation on the Northern Alternative is similar to that on the Proposed Route, the EIS should address whether the water that would be affected by a spill on the Northern Route is potable, and whether as many people along the Northern Route depend on that potable water for their livelihood as do those living along the Proposed Route. This is important in the BLM's selection of route.

86-25 4-2 "Although final engineering design has not yet been completed, All American has indicated their pipeline would meet all applicable regulations, standards, and codes." "Because the final engineering design is not complete, it is not yet possible to comprehensively evaluate whether the pipeline design and operating practices would comply with all industry standards and regulatory

RESPONSE TO LETTER 86

86-20 Your comment regarding indirect impacts of refineries is noted; please refer to the response to Comment 56-9.

86-21 Your comment concerning California refineries is noted. Please refer to the response to Comment 6-1.

86-22 The states of California and Texas are under the same EPA standards. The Los Angeles Basin is approaching the limit for reasonable mitigation of increased air quality exceedances. The Houston area is also in exceedance of some standards but has some excess capacity in its existing air quality permits. For legal and economic reasons, the Gulf Coast refineries are attractive to the oil industry.

AAPL assumes that its oil would displace heavy foreign crude and no net increase in refining of heavy crude would result. The Los Angeles Basin refineries have less capacity for refining heavy crude. Please see response to Comment 56-1.

Please refer to the response to Comment 6-1.

86-23 Your comment concerning supply and demand is noted. Please refer to the response to Comment 56-1.

86-24 Overall, karstic terrain and active karstic process do not appear to pose a geologic hazard to the pipeline or surface structures. However, local circumstances may indicate a need for additional mitigative measures during construction. Please refer to Mitigation Measures G-1 and G-2 in Appendix A of the Final SEIS.

86-25 Please refer to the response to Comment 6-15 and to Mitigation Measure SS-3 in Appendix A.

LETTER 86

86-25 Cont.

codes." These two sentences "say it all" as to inadequacy of the EIS. It is improper to attempt to evaluate a project before plans for that project are complete. In the absence of a complete plan, BLM must rely on the representations of the applicant, who has a decided bias towards completing their project. Until the engineering design is complete, therefore, any assessment of the environmental impact will be incomplete and insufficient.

86-26

4-5 The EIS asserts that "[t]he ROW is located a sufficient distance from sensitive existing facilities such as schools, hospitals, and densely populated areas to provide no significant risk to these receptors in the event of fire." The Hays County Independent School District buildings are right next to the last surveyed ROW on Highway 2770 in Hays County, west of the Michaelis Ranch. The impact of the ROW on the school buildings and students should be addressed.

86-27

4-13 The EIS asserts that "deeper pipe burial" is a mitigating measure over the Edwards Aquifer Recharge Zone. However, making a deeper trench in the karstic formation would only be nearer and more destructive to the aquifer formation. What appears to be a mitigating measure might actually produce a pronounced environmental impact. This needs to be reevaluated.

86-28

4-26 The EIS needs to address the impact of releasing possibly contaminated water from hydrostatic tests into an aquifer area. This appears to be a good source for pollution, especially of a limestone aquifer such as the Edwards Aquifer. The EIS should consider on-the-spot purification procedures to help mitigation of such a danger.

86-29

The EIS acknowledges that trench excavation via blasting is a potential problem, but dismisses it after superficial analysis. If there are any studies on the possible effects of blasting on a limestone aquifer, these should be reviewed. The prohibition of all blasting over the Recharge Zone seems to be a reasonable mitigation measure which BLM should evaluate.

RESPONSE TO LETTER 86

86-26 Although the ROW is adjacent to the school property, the pipeline would be more than 400 ft from the nearest structure. This would be outside the 65 dBA noise significance threshold. DOT regulations require a 50-ft separation of the pipeline from public buildings, and the pipeline meets these specifications.

86-27 Deeper pipe burial decreases the likelihood of an oil spill due to outside force impact, which is the cause of a significant number of oil spills. Adding an additional 1 ft of ground cover to the pipe does not significantly increase the risk that oil will enter the groundwater.

86-28 Please see the response to Comment 56-100 for information regarding the disposal of hydrostatic test water.

86-29 Prohibition of all blasting over the entire recharge zone is unwarranted and unnecessary as a mitigation measure. The appropriate mitigation measure is the implementation of proper blasting techniques, except where special circumstances preclude blasting altogether. Please refer to the response to Comment 6-2 regarding blast design and Mitigation Measure G-5 in Appendix A.

LETTER 86

William Haigh
March 30, 1987
Page 7

86-30 There needs to be a comprehensive study on the deep well groundbeds that AAP plans to use. This is acknowledged as a potential danger, but there is no specification of how these structures will be built. The EIS acknowledges that, if AAP's Cathodic Protection Plan is inadequate, "there could be significant impacts upon groundwater quality." These impacts need to be addressed in the EIS.

86-31 4-27 The soluble components of crude oil include benzene and toluene. Substances this dangerous (i.e. carcinogenic) cannot be dismissed lightly. The EIS needs to study the carcinogenic concentration for such substances vs. the projected concentration of such substances from an oil spill. This could have a great impact on the water quality evaluation.

86-32 4-34 The EIS needs to treat the issue of deep well groundbeds more thoroughly. As in the construction phase, the EIS acknowledges these are a possible problem upon abandonment. There does not appear to be any guarantee that AAP would properly seal such wells upon abandonment. The EIS must address the possible impact of improper abandonment of deep well groundbeds and specify what methods of enforcing improper abandonment exist.

86-33 4-46 The EIS asserts that "no active sinkholes or subsidence areas have been identified along the Proposed Route on the limestone terrain of the Edwards Plateau and Balcones Fault Zone. . . . The karst in the Edwards Plateau Region is generally considered to be inactive. . . ." Although no mention is made of sinkhole size, every time we have heavy rains, there are new "holes" in the ground. Over the 13-15 year period since the cited studies, the surface of the ground has changed. The mouth of one cave, which Max Michaelis' grandfather filled in with rocks, old wire, and so forth, has opened up considerably from rain runoff. There are many "active" sinkholes on our property. The EIS needs to evaluate the potential impact of such sinkholes in its oil spill scenario.

86-34 4-67-4-71 The semantics on these pages are terribly confusing.

RESPONSE TO LETTER 86

86-30 Please refer to the Modifications and Corrections section for page 2-7 for more details on the deep-well groundbeds. Your comment regarding the need for a comprehensive study on deep-well groundbeds is noted.

86-31 Your comment concerning health effects of components such as benzene and toluene is noted. Please refer to Modifications and Corrections to Draft SEIS Appendix A in Section 3.3 of the Final SEIS.

86-32 Your comment concerning deep-well groundbeds is noted. Please refer to the response to Comment 86-30.

86-33 Overall, karstic terrain and active karstic process do not appear to pose a geologic hazard to the pipeline or surface structures. However, local circumstances may indicate a need for additional mitigative measures during construction. Please refer to Mitigation Measures G-1 and G-2 in Appendix A of the Final SEIS.

86-34 The terminology used is based on accepted regulatory terms and is difficult for non-cultural resource specialists to fully understand.

LETTER 86

86-35 4-90 The EIS asserts that "after restoration is complete, grazing would again be possible." Right now, with existing native grasses and conscientious cyclical use, it takes months for sufficient re-growth to support our cattle heard, let alone the deer population -- and that is with normal rainfall. It is doubtful that reclamation of delicate topsoil would be possible in the one-year period cited for such reclamation. This should be reevaluated for its impact on short and long-term productivity of the land.

86-36 4-92 The EIS asserts that "the State has no authority to regulate pipeline location." This is incorrect. No federal law pre-empts the State's right to regulate land use planning. Texas Water Code § 26.131 makes the Texas Railroad Commission "solely responsible" for the prevention of pollution of surface and subsurface water resulting from the transportation of crude oil. Texas Natural Resources Code § 91.101 mandates that the Railroad Commission promulgate rules in order to discharge this responsibility. Read together, these provisions give the Texas Railroad Commission not only the authority but also the duty to regulate pipeline location.

86-37 The fact that 67% of Texas' exotic game animals could be impacted by the Proposed Route, combined with the possibility that AAP would remove their fences during construction, militate strongly against the Proposed Route. The EIS needs to address the impact of breaking down fences enclosing such animals, especially in case negotiations break down. If AAP pulls down the fences without making adequate provisions for the animals, the animals could be destroyed.

86-38 The EIS asserts that "no significant long-term impacts to urban growth patterns would occur." I am not sure if this area is considered rural or urban Austin, but houses are and have been under construction within "spitting distance" of the Proposed Route ROW for years. This is highly desirable development property, probably the most highly desirable in the state. The EIS needs to re-examine the long-term impacts of the Proposed Route on urban growth patterns.

RESPONSE TO LETTER 86

86-35 Your comment concerning reclamation is noted. Depending on the region and site-specific conditions, complete restoration could take from one to five years. Application of erosion control and revegetation plans would stabilize soils with respect to erosion to near preconstruction conditions within one year following implementation of these plans. Also, please refer to the revised Mitigation Measure TB-1, and the newly developed Mitigation Measure S-1 concerning reclamation in Appendix A.

86-36 Your comment concerning the TRRC is noted. Please refer to Comment 6-15.

86-37 Temporary gates would be installed in all breached fences to prevent loss of animals during construction. Please refer to Section 2.2.2.2 on page 2-19 of the Draft SEIS. Also, please refer to Mitigation Measure LU-3 in Appendix A.

86-38 The land use analysis for the Draft SEIS carefully considered the potential for short-term and long-term impacts on urban growth patterns from development of the All American Pipeline along the Proposed Route and the Northern and Southern Alternatives. The results of the analysis were that such effects would be minimal to nonexistent; certainly not significant. Residential areas of various densities and price ranges coexist successfully with buried crude oil pipelines in many U.S. cities, including Houston, Los Angeles, Tulsa, and even Austin. Typically, the only observable above-ground effect is a strip of land without structures. In a low density area of single-family residences, such as that crossed by the Proposed Route, open areas are quite common and a pipeline ROW would barely be noticeable once surface reclamation was completed. In higher density areas, pipeline ROWs may even be an amenity, providing needed open space if properly landscaped, although high land prices sometimes limit pipelines to street ROWs where they are not discernable to casual observers.

LETTER 86

William Haigh
March 30, 1987
Page 9

86-39 4-175 Since the primary concern in the operation phase of the pipeline is an oil spill, it is important that the final Oil Spill Contingency Plan be completed prior to preparation of the final EIS. Since this plan would permanently be directly involved in mitigating any oil spill, the SEIS is incomplete without the final OSCP.

General Comments:

86-40 1. Michaelis Ranch -- Within the past four years, after periods of heavy and/or extended rainfall and for up to two weeks afterwards, water from the wells is clouded with dirt and debris. This has never happened before in my husband's memory, which spans over thirty years. We have had two wells recased within the last two years, and this still occurs. The Storms in Dripping Springs have noticed the same phenomenon in the last year. This suggests that the delicate imbalance of the aquifer is possibly due to construction, although it could be due to changes in the underground watercourses. The BLM needs to investigate this phenomenon before allowing any further construction in this area, as it is obviously extremely sensitive.

86-41 2. In reference to the worst case scenario near Onion Creek, which is approximately two miles upstream of some of our property, the water marks on the trees and fences are well over twenty feet from the stream bed. The EIS' references to CFS and velocity of water is underplayed immensely.

86-42 3. In its publicity campaign, AAP has repeatedly asserted that its pipeline would play a vital role in national defense and American energy independence. AAP has also asserted that the pipeline would create many jobs in Texas. I have never seen any data to support any of these contentions. For such claims to stand, there must be some support. I would think that, to the extent that pipeline employees were not from Texas, any benefit of increased employment would not inure to Texas at all. If these assertions are unfounded, there might well be no necessity for the pipeline.

86-43 4. Isn't it really the case that the "no project" alternative has been effectively foreclosed because AAP has already constructed its pipeline as far as McCamey, Texas? If AAP had proposed the entire pipeline route at the beginning, the Pac-Tex pipeline would have been a viable alternative. Is AAP now to profit by having proposed a partial route and having constructed its pipeline to the proposed point before obtaining approval for

RESPONSE TO LETTER 86

86-39 The Oil Spill Contingency Plan is enforceable under stipulations identified in the Final SEIS. Please refer to the response to Comment 18-3 and to Mitigation Measure SS-1 in Appendix A.

86-40 Your concern regarding the cloudiness of your well water is noted.

86-41 The catastrophic spill scenario for Onion Creek was designed to assume conditions which would have maximum impacts to the Edwards Aquifer. The flow assumption for Onion Creek ensures that all the flow and oil would enter the aquifer. A large flow or flood would dilute the oil and have the oil float on the surface of the water. Very little oil would enter the Edwards Aquifer. Flows on Onion Creek can be much larger than the one assumed in the catastrophic spill scenario.

86-42 Your comment concerning project need is noted. Please refer to the response to Comment 56-1.

86-43 The primary goal of the All American Pipeline is to transport heavy California crude; whereas, the primary goal of the Pactex Pipeline is to transport Alaskan North Slope crude. The two projects are not directly competing. The No Project Alternative has not been entirely foreclosed. The No Project Alternative discussion has been expanded; please refer to the Modifications and Corrections section for pages 2-37 and 4-172.

LETTER 86

86-43 Cont. its second segment? BLM should reconsider the Pac-Tex pipeline as an alternative under the "no route" heading.

Please reexamine the EIS in light of these comments.

Sincerely,

Sharon Michaelis

Sharon Michaelis

SM/dsg

RESPONSE TO LETTER 86

LETTER 87

March 30, 1987
1302 Shafter
San Angelo, TX 76901

RECEIVED
BUREAU OF LAND MANAGEMENT
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DISTRICT
RIVERSIDE, CA.

Mr. William Haigh, Project Manager
Bureau of Land Management
1695 Spruce St.
Riverside, CA 92507

Dear Mr. Haigh:

As a participant in the B.L.M. hearing on the proposed All-American Pipeline in San Angelo on Tuesday, March 23, 1987, I understand that the purpose of the hearing was to review the Draft Environmental Impact Study prepared by Environmental Research Technology. In particular, we were asked to testify as to whether the draft EIS is complete, whether it is accurate, and whether the inclusions and omissions are germaine; further, we could offer mitigating measures. The economic impact of the pipeline, political and legal questions, and matters of personal preference, damages, and fairness were not to be considered. At the hearing I testified extemporaneously. This letter contains my written testimony.

The two primary environmental questions are (a) the effects and probability of a failure of the system of containment of the crude oil within the line, as in leaks, spills, and other accidents; and (b) the effect of the construction process and the pipeline in place once constructed. Representing myself, I will address these questions from my perspective as a physician with a concern for the impact of the environment on public health, from my perspective as a land owner in the Concho River Sensitive Area with knowledge of a substantial area of terrain, and from my perspective as a retailer of water filters concerned with petrochemical pollutions of municipal and agricultural water sources. I will summarize my contributions to the EIS text and suggestions for mitigating measures, and will attach references and reprints.

I. Introduction

87-1 There is no question of whether the pipeline will leak. It will. All the works of man are fallible and all pipelines leak, at some time and some place. The pollution of water resources in Texas from leaking petrochemical installations is already an alarming problem. (see references 1.King, 2. Rose, 3. Krausse, and 4. Dallas Times Herald.) As Rose (5.) states, 'By analogy, the chance of a certain baseball player pitching a 'no-hitter' in any one game is quite low, but the chance of someone throwing a 'no hitter' sometime during the entire season is quite high.' In my opinion, the overall tone of the draft EIS is grossly irresponsible in its overall tone of minimizing this risk. Because water quality and sufficiency is a serious concern in Texas, I propose that ERT include in the final EIS references (1.) and (2.) in toto.

RESPONSE TO LETTER 87

87-1 Papers by King and Rose, attached to this letter, will be published in their entirety.

LETTER 87

Concern for the integrity of the Edwards aquifer has been addressed by these and other authors, and by other witnesses in this series of hearings, especially in Travis and Hayes Counties. The draft EIS is inaccurate to allow readers to infer that the Northern Route takes the pipeline north of the Edwards aquifer. According to Rose, the drainage basin of the Concho River, which includes Irion, Tom Green, and Concho Counties, is the northernmost part of the Edwards system. In particular, the Concho River Sensitive Area, including the Leona and Bullwagon aquifers, home to the headwaters of the South Concho River, may be said to be within the Edwards system and subject to the same risk described so eloquently by witnesses at the San Marcos hearing. The Hickory Sands aquifer in the region of the Stacy Dam site should be scrutinized in the same light. Unless the Northern Route runs well north of San Angelo, it will not avoid the Edwards aquifer. As a mitigating measure, I propose that
87-2 ERT consider a route well north of O.C.Fisher reservoir, the new Stacy Lake, and their major tributaries, and add it to their final draft, or that the pipeline be discontinued in Tom Green County and resumed east of Stacy Dam.

I make the above radical proposal because aquifers in North Central Texas are even more vulnerable than those in the Hill Country due to the presence of far more numerous old petroleum installations. Here we have relatively more oil wells and relatively fewer water wells, and our risk of water contamination by petrochemicals, salt, and sulfur is already notorious. Such contamination is a common occurence and common knowledge in Christoval in the Concho River Sensitive area, and must not be allowed to be exacerbated, by blasting or other man-made occurences. Similarly, what has already happened in the Concho River Sensitive Area must be prevented in the Hickory Sands-Stacy Dam area.

II. Physician's Position

As a physician, I am concerned that drinking water remain free of toxic pollutants, and that no toxins enter the food chain through polluted agricultural water. The Environmental Health Center of Dallas, Texas, is an international center for patients who are victims of toxic pollutants; I myself have been hospitalized by this group of physicians six times, and I have extensive experience with the effect of polluted drinking water and wide acquaintance with other victims. I have attended conferences, symposia, and conventions on the topic of the effect fo petrochemical pollution on human health.

87-3

Tom Green County and San Angelo are particularly vulnerable to risk of petrochemical pollution of water, because of the combination of a relatively large, dense population in a semi-arid area. Residents have gone to great trouble to secure adequate water (6., 7.), but even the County's three major reservoirs are not sufficient in all seasons, and water must be drawn from the Concho River, or reservoirs and wells in neighboring counties. The quality of water here is marginal; residents who can afford it buy home water filters or bottled drinking water for better taste or as a necessary adjunct in the treatment of medical conditions where salt or mineral

RESPONSE TO LETTER 87

87-2 Your comments regarding Edwards Plateau Aquifer are noted. Please refer to response to Comment 6-14. The alternatives analysis considered routes feasible from an engineering perspective and which were environmentally acceptable. By proper construction and operation procedures and BLM enforced mitigation, the BLM considers the Northern Alternative environmentally acceptable.

87-3 Your comments regarding the vulnerability of Tom Green County and San Angelo water supplies and lack of discussion on toxic components of crude are noted. Please refer to response to Comment 6-14 and to the Modifications and Corrections Section 3.3 for the revised Appendix A.

LETTER 87

intake must be restricted. A petrochemical leak in a smaller community with less marginal water supply is serious, as in the recent Phillips pipeline leak in Mineral Wells (4.). The same leak into a San Angelo reservoir during a time of drouth would be disastrous. A leak into the Leona, Bullwagon, and Hickory Sands aquifers could prolong the disaster over an indefinite period of time. Rose and other witnesses have stated that a leak into the Edwards aquifer could not be cleaned up, that the work of nature, primarily by rainfall and its percolation through the bedrock, is the only cure for such a leak. In San Angelo, this problem is compounded by the fact that our rainfall is less than those areas of the Edwards aqifer to the south and east. The same leak into the Leona, Bullwagon, and Hickory Sands aquifers would take longer to clear naturally than those parts of the Edwards system south and east.

87-3 Cont. The more than 80,000 residents of Tom Green County must not be exposed to the risk of toxic drinking water. The draft EIS is irresponsible in its discussion of drinking water polluted by a possible spill. The EIS describes a scenario in which a leak leaves petroleum in Lake Travis in the proportion of .002%. This is alarming rather than reassuring. The tasteable threshhold of petroleum in water is less than one part per million; such water is toxic and non-potable. The 'Environmental Consequences' section does not discuss the soluble components of crude oil (2., 5.) which will neither evaporate nor be scooped up by mechanical means. This omission is blatantly misleading, as it is the soluble fraction (up to 47%) of crude oil that cannot be removed and which would account for the toxicity in water polluted by such a spill. Given the paucity of rainfall in Tom Green relative to Travis County, the scenario described for Lake Travis would be compounded if applied to a Tom Green County reservoir, perhaps to the point of rendering such reservoir useless. I foresee cleaning such a spill in such a reservoir only by emptying it, perhaps several times over.

The problem of soluble hydrocarbons is discussed only in the Appendix, Section C, of the EIS. This problem must be enlarged upon and given greater prominence in the final publication. The San Angelo City Council has proposed additional safety and monitoring procedures for protection of municipal water. I not only second their proposals, I add that there should be more of the same. It is imperative that such mitigating measures be included in the final EIS.

87-4 It is sad that no law exists to prevent the extinction of the human species, while we in north central Texas are required by law to provide for the survival of the Concho River Snake (8., 9.) However, by a triumph of irony it may be that the protection of our snake will assure the continued health of our residents, at least as far as assuring safe, potable water. The same polluted water that would harm people would harm the snake, and it is clear from the map that the proposed Northern Route goes right by it not through the proposed habitat of the snake. The few pages or lines in the appendix do not describe what is to be done to protect the snake from construction or pollution. The draft EIS is deficient in its study on the effect of the pipeline on the snake; by law, this deficiency must be remedied or the pipeline can be stalled or stopped

RESPONSE TO LETTER 87

87-4 Your comment regarding the Concho water snake is noted. It is unclear as to what is meant by your request that the Stacy Dam be designated a "sensitive area". Page M-16 and Map 2-3, Sheet 3 of the Draft SEIS has designated the Colorado River Crossing as a "Sensitive Receptor" (T16) due to the Concho water snake habitat potentially affected by the pipeline. Because the Concho water snake is a federally-designated species, additional analysis has gone into this river crossing through a Biological Assessment. The USFWS will examine the crossing area and require detailed engineering information including burial depth, block valve placement, and other protection measures in preparing their Biological Opinion.

It is also important to note that the pipeline route for the Northern Alternative was realigned early in the environmental analysis process to avoid potential impacts to Stacy Reservoir. The pipeline is located approximately 3 miles downstream of the proposed dam.

LETTER 87

altogether.

The construction of Stacy Dam has been postponed at great length for the snake, and only recently given the go-ahead (10.) This means that Stacy Dam is a 'related project' which was of less consideration at the time of the original draft EIS. The importance
87-4 of this project is grossly underrepresented in the present draft.
Cont. I propose that this deficiency be corrected in the final draft by designating the Stacy Dam site and Concho River snake habitat a Sensitive Area, subject to the same careful consideration as the Concho River Sensitive Area near Christoval. It is primarily for the development of more expert testimony on the related project and the endangered species that I support a thirty-day extension of the deadline for testimony on the Northern Route. I believe that more attention to these two concerns can only benefit the public health of San Angelo residents by further insuring their water supply against petroleum leaks and spills.

III. A Landowner's Position

The experience and expertise of occupants of the surface of the land for the right of way of the proposed Northern Route may be considered by the B.L.M. and ERT entirely apart from their personal desires and preferences. I am a landowner with an interest in a substantial portion of the designated Concho River Sensitive Area. Enclosed is a map entitled 'Door Key Ranch Area.' I own a 3/4 undivided interest in the tract numbered Seven and a half undivided interest in the small tract labeled Nine, and I am a contingent remainderman in the life estate of my cousin, J.Willis Johnson III, which includes tract Five and the rest of the undivided interest. Altogether, the pipeline traverses about 4.3 miles of property owned by my family or myself, mostly in the designated Sensitive Area. The surface we own covers most of the area in U.S. Geological
87-5 Survey 7.5 minute topographical map labeled 'Christoval Quadrangle,' and substantial portions of the topos labeled 'Susan Peak' and 'Pecan Station.' On these topographic maps are the northern parts of the Edwards system, the Leona and Bullwagon aquifers. The ranchers and I are most anxious to assure the continuing freshness and quantity of the important springs on this property, and we fear that the pipeline passes too close to them. Within the Line GW8 demarcating the area subject to contamination is the important Millpond Spring on our property; in the drouth of the 1950's water had to be trucked from this spring to ranches for miles around. The pipeline passes less than a mile from the strongest spring at the headwaters of Pecan Creek, an important tributary to the South Concho River and the Twin Buttes Reservoir. We second and endorse the testimony of other witnesses from Tom Green County who propose that blasting be forbidden in this area. Again I propose that the route be moved northward as far as possible, preferably to north Sterling County and out of our aquifer region altogether.

87-6 Christoval ranchers have raised two additional environmental concerns. First, earlier buried pipelines in this rough country resulted in piles of rock being left above the topsoil. There is no place to put such rock after it is excavated and displaced

RESPONSE TO LETTER 87

87-5 Your comments regarding your concern for the water quality in springs on your property is noted. Your desire to see the Northern Alternative moved north to Sterling County is also noted. Please refer to response to Comment 6-14 and also to the revised Mitigation Measures G-1, G-2, and GW-1 in Appendix A.

87-6 Thank you for your comment concerning reclamation. Revegetation and reclamation of the pipeline ROW is planned for the entire route (see Mitigation Measure S-1 in Appendix A). As noted in the project description (see for example page 2-21 of the Draft SEIS), the construction ROW would be about 100 ft wide. Revegetation seed mixtures, timing, and other practices would be decided in conjunction with the BLM Authorized Officer. The wishes and needs of the landowner are primary except where the stability of the ROW is in question.

LETTER 87

by the pipeline. It does not lend itself to settling back to a level surface like excavated dirt. It is certain that such rock piles hinder ranching; it is not certain what they do to wildlife, or how they can be disposed of. It cannot be overemphasized that excavation in the Concho River Sensitive Area displaces rock, not soil.

87-6 Cont. Second, the local ranchers are concerned for the restoration of turf after construction, which leaves a bare strip perhaps 300 yards wide. There is not sufficient rainfall to assure the regrowth of grass in one season, and the bare spot is subject to erosion by wind and invasion by weeds, some toxic. It is not clear in the EIS how turf is to be restored for the benefit of wildlife as well as domestic animals. On Door Key Ranch, 4.3 miles of bare strip is not insignificant.

87-7 The occupants of the land also believe that monitors and valves are not placed at intervals sufficiently small. Other witnesses have testified as to the rapidity with which petroleum can disperse into aquifers from a leak or spill. It is possible that a slow or small leak would first be discovered by a cowboy on a slow horse after an interval of days, by which time the leak could have already damaged the aquifer, San Angelo's marginal surface water supply, or an important spring. In the Christoval area, and in particular on the Door Key Ranch which is vast, I recommend monitors at every fence line and water crossing, and a block valve on both sides of every water crossing and spring. Again, this reinforces the recommendations of the San Angelo City Council, with special attention to the rural area we know best. As Rose states, we do not believe that the added expense would cause the Celeron Corporation to abandon the project. We are also certain that we alone, in the position of the fence rider on the horse, could not humanly respond to an emergency spill with the rapidity that it deserves.

IV. A Businesswoman's Position

87-8 Home, offices, and municipalities are also 'environments' and must not be ignored in the EIS only because they are not rural or out-of doors. As a retailer of water filters for home and office, I notice that the draft EIS is deficient in explaining what is to be done for polluted water <u>at the point of use</u> in case of a spill. I have already discussed my dissatisfaction with the EIS treatment of water pollution at the point of <u>origin</u>.

Water purification technology has progressed very little since the nineteenth century; usually we employ the same activated charcoal filtration for removal of hydrocarbons that has been known for the last 100 years. This system is good for removing trace contaminants; it is grossly inefficient for removing portions of contamination that can be measured in percentages. Distillation of water, an even older technique, is energy-inefficient and may actually concentrate some fractions of hydrocarbons in the distillate. Reverse osmosis is the relative newcomer in water purification technology, but it is unsuitable for large-scale use in a semi-arid region because it requires nine parts of contaminated water to produce one part of pure water; seven or eight parts are then discarded.

RESPONSE TO LETTER 87

87-7 Your comment concerning oil spill leak detection and oil spill response is noted. Please refer to Comment 56-19 and the Modifications and Corrections section for pages 4-6 and B-15.

87-8 As discussed in the response to Comment 6-4, most of the oil would float on the surface of the water or volatilize. The floating oil can be contained with booms and removed with skimmers before the oil reaches the San Angelo filter plant. The fraction of oil that is dissolved in the water can be removed by rinsing the municipal filter. Please refer to Mitigation Measure SS-1 in Appendix A.

LETTER 87

87-8 Cont. San Angelo has already considered installing a $40 million municipal filter including the charcoal element, for use when drouth concentrates the natural contaminants of the reservoirs and river (6.) The final EIS should address the possibility of use of this filter in case of a petroleum spill into the municipal water supply. I believe that such a filter could well be overwhelmed by a major spill, and that it morally behooves the Celeron company and ERT to calculate just how effective filters could be at removing the soluble hydrocarbons. Since soluble hydrocarbons could literally destroy San Angelo's reservoirs, to avoid this issue would be an unforgiveable whitewash.

V. Summary

87-9 1. Problem of soluble hydrocarbon contamination of water is grossly underrepresented in Draft EIS as a whole.
EIS: incomplete, inaccurate
ERT; should undertake more research with consultants and specialists in variety of fields, especially those knowledgeable about Tom Green County. References 1 and 2 to be included in EIS.
Mitigating Measures: Pipeline company should be made resoonsible by funds in escrow or pre-arranged insurance for water damage.

87-10 2. Northern Route does NOT avoid Edwards aquifer, which extends into Irion, Tom Green, and Concho Counties.
EIS: inaccurate
ERT: should incorporate Rose article (2) and further consult hydrologists, geologists, and occupants familiar with local water.
Mitigating Measures: Line should run very much farther north, as in north Sterling County; or line should be discontinued at Concho River Sensitive area and resumed east of Stacy Dam; Safety precautions to be greatly increased in Tom Green County.

87-11 3. Problem of deteriorating old pipelines and wells subject to breakage and contaminating north central Texas water makes this area actually MORE vulnerable than Hill Country or Balcones Fault zone to loss of municipal and agricultural water supplies through misadventure.
EIS: incomplete
ERT: should pursue and enlarge upon reference (1.)
Mitigating measures: Blasting should be forbiddsen in Tom Green County, Concho River Sensitive area, and Stacy Dam area. Pipelline company required to plug wells and repair installations broken in construction path and immediate surround.

87-12 4. San Angelo is dryest large population center, or large t dry population center in study. Marginality, vulnerability, and quality of public water supply does not get enough emphasis.
EIS: incomplete
ERT: Risk to San Angelo should be re-evaluated. Deadline for written testimony should be extended.
Mitigating Measures: Consider skipping San Angelo area altogether.

RESPONSE TO LETTER 87

87-9 Your comment regarding hydrocarbon contamination of water is noted. Please refer the Modifications and Corrections section for page A-1 and to Mitigation Measures GW-1, GW-2, and GW-3 in Appendix A.

87-10 We agree; please refer to the Modifications and Corrections section for pages 3-114 and 4-113 and newly added Figures 3-1a and 3-1b for additional information on the Edwards-Trinity Plateau Aquifer.

87-11 Your comment regarding increased vulnerability of groundwater in your area as a result of old pipelines and wells is noted. Please refer to Mitigation Measure G-1 in Appendix A and Mitigation Measure G-2 on page 4-181 of the Draft SEIS.

Please refer to the response to Comments 6-2 and 6-10 regarding blast design.

87-12 Your comment regarding reevaluation of oil spill risk to San Angelo is noted. Please refer to response to Comment 6-14.

LETTER 87

87-13 4. Mitigating measures continued: return to original plan of using pipelines already in place.

87-14 5. Stacy Dam, a 'related project,' has only recently received go-ahead and its area needs to be designated as Sensitive to concentrate more study on anticipated new conditions.
EIS: incomplete
ERT: Re-examine this area. More testimony on the area is the primary reason for the request for extension of the deadline.

87-15 6. Concho river snake habitat is not shown to be secure. Habitat has only recently been mandated.
EIS, ERT: same as 5.

87-16 7. Additional mitigating measures:
a. Safeguards proposed by San Angelo City Council and Tom Green County Commission are endorsed.
b. Landowners and occupants of rural right-of-way should be consulted for more frequent placement of monitors, valves, and other safeguards.
c. Restoration of surface to be detailed and committed by prepaid insurance or funds in escrow prior to condemnation.
d. Private inspection of line to be mandated.

Respectfully submitted,

Ruth G. McGill, M.D.

Ruth G. McGill, M.D.

Enc.

RESPONSE TO LETTER 87

87-13 Please refer to the expanded discussion of the No Project Alternative found in the Modifications and Corrections section for pages 2-46 and 4-172.

87-14 The pipeline alignment as analyzed in the Draft SEIS does not cross the site of the Stacy Dam or Reservoir; therefore, BLM does not believe that an extension of the public comment period is necessary. Please refer also to the response to Comment 87-4.

87-15 Please refer to the response to Comment 87-4.

87-16 Please refer to Appendix A of the Final SEIS for mitigation measures addressing system safety and ROW restoration.

References

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3. Krausse, Henry, 'Old oil lines called peril to aquifer,' Austin American Statesman

4. 'Mineral Wells copes with foul water,' Dallas Times Herald, Tuesday March 3, 1987, p. B-1

5. Rose, Peter R., 'Expert voices doubts on pipeline.' San Angelo Standard Times, Sun. Feb. 16, 1986, p. 6-B

6. Kilgore, Le, 'Purity of city's water improves,' San Angelo Standard Times, Fri. Mar. 27, 1987, p. 1-C

7. 'Lake levels break record,' San Angelo Standard Times, Fri. Mar. 27, 1987, p. 1-A

8. Henderson, Rex, 'Water snake is a costly critter,' San Angelo Standard Times, Wed. Mar. 25, 1987, V. 67, No. 54, p. 1-A

9. Cowan, Jack, 'Dam habitat sheds dollars,' San Angelo Standard Times, Fri. Mar. 27, 1987, p. 1-C

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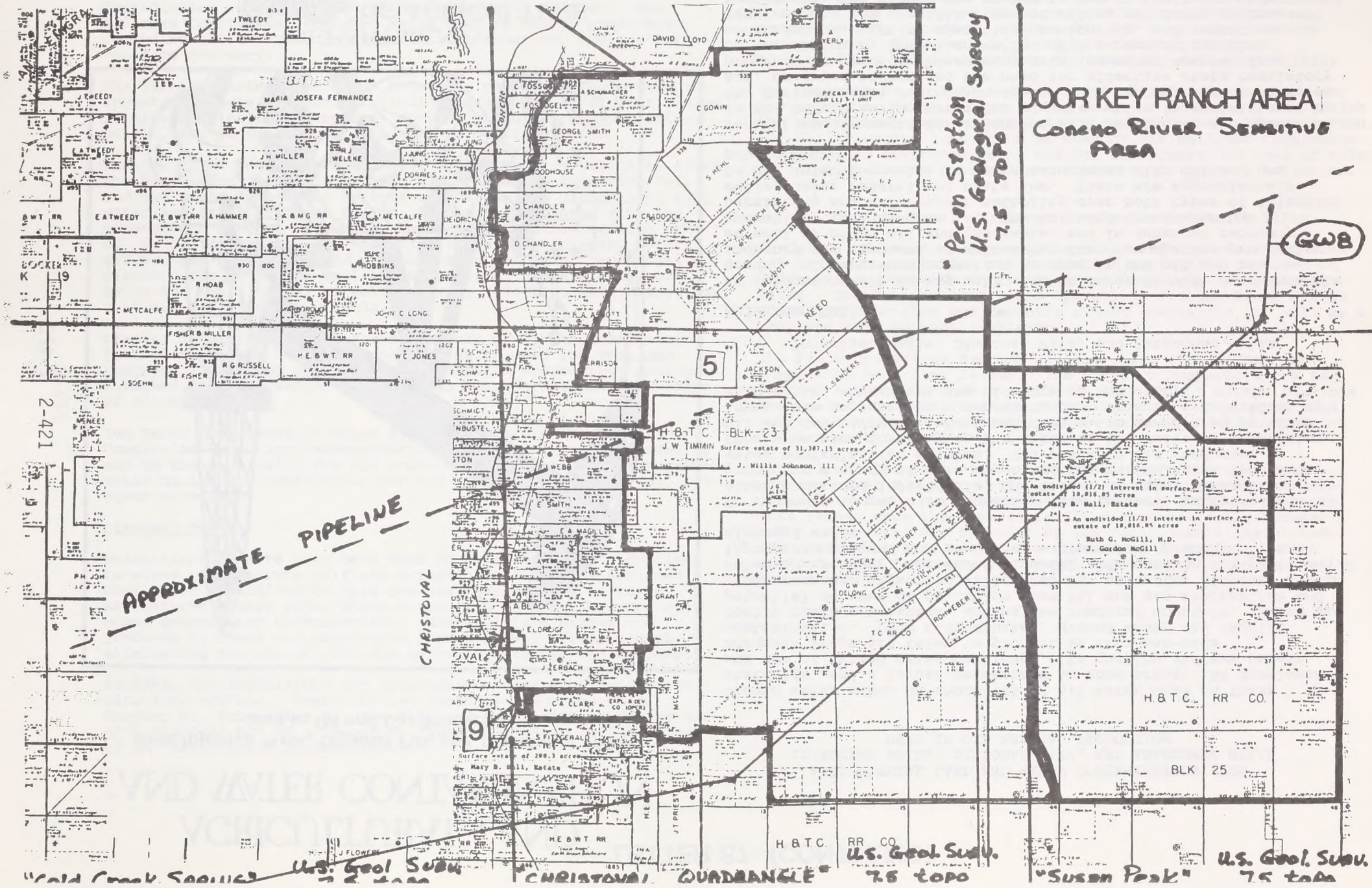
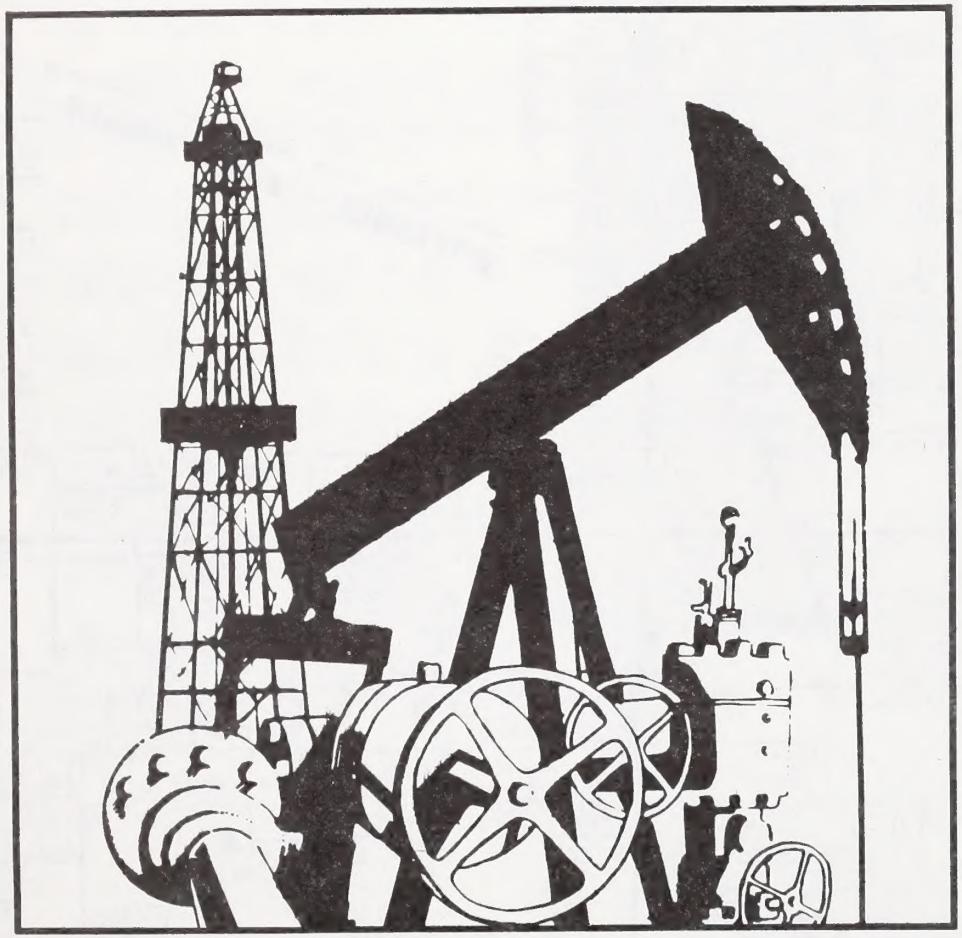

DOOR KEY RANCH AREA
CONCHO RIVER SENSITIVE AREA
"Pecan Station" U.S. Geological Survey 7.5 TOPO
GW8
APPROXIMATE PIPELINE
CHRISTOVAL
2-421
H & T C BLK 23
J W TIMMIN Surface estate of 31,387.15 acres
J. Willis Johnson, III
Mary B. Mall, Estate
Ruth G. McGill, M.D.
J. Gordon McGill
H.&T.C. RR CO.
BLK 25
H & T.C. RR CO.
"Cold Creek Springs" U.S. Geol. Survey 7.5 topo
CHRISTOVAL QUADRANGLE
U.S. Geol. Survey 7.5 topo
"Susan Peak" U.S. Geol. Survey 7.5 topo

AGRICULTURAL LAND AND WATER CONTAMINATION

from Injection Wells, Disposal Pits, and Abandoned Wells used in Oil and Gas Production



DEPARTMENT OF AGRICULTURE

OFFICE OF NATURAL RESOURCES

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Printed on recycled paper.

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AGRICULTURAL LAND AND WATER CONTAMINATION FROM INJECTION WELLS, DISPOSAL PITS, AND ABANDONED WELLS USED IN OIL AND GAS PRODUCTION

Ground water makes up about 60% of all water used in Texas statewide, and a larger percentage in some areas. As development and use of ground water continues, its quality suffers unless adequate steps are taken to protect it from man-made contamination. Once contaminated, ground water may require costly cleanup measures, and may be rendered unusable. Among the potential sources of pollution from oil and gas exploration and production are injection wells used for saltwater disposal and in enhanced recovery, saltwater disposal pits used in the past, and improperly plugged and abandoned exploration, production, and disposal wells.

In response to periodic inquiries from farmers, ranchers, and other concerned individuals, the Office of Natural Resources conducted a study of this aspect of the agricultural land and water contamination problem. The research was conducted by Thomas Gorman, formerly on the staff of the Railroad Commission, Oil and Gas Division. Railroad Commission staff also provided invaluable cooperation and assistance. This report, written by Rick Piltz, summarizes the findings of the study.

Injection Wells, Disposal Pits, and Abandoned Wells

Injection Wells

An injection well is any well used to force liquids deep into the ground. Underground injection is used in the oil and gas industry for disposal of salt water that accompanies production, as well as other oil and gas waste, and in enhanced recovery operations (see Diagram 1). The Railroad Commission has permitting and enforcement authority over both types of injection wells, under federal and state law. There are approximately 50,000 injection wells in Texas associated with oil and gas production.

Federal requirements for injection-well regulation are specified in the Safe Drinking Water Act of 1974, which is administered by the Environmental Protection Agency. In the Safe Drinking Water Act, Congress recognized the need for effective state regulatory programs to protect underground drinking-water sources from contamination by injection wells. EPA's regulations list construction, permit, operating, monitoring, and reporting requirements for specific types of wells, set forth enforcement procedures, and direct the states to set up their own underground injection-control programs to protect defined drinking-water sources.

In 1980, the Railroad Commission created an Underground Injection Control (UIC) Section in its Oil and Gas Division to administer a program consistent with federal and state law. In 1982, EPA granted primary enforcement authority to the state.

Jurisdiction over injection wells in Texas is divided. The Railroad Commission regulates wells used in energy production, including oil and gas, in situ coal gasification, and geothermal resource recovery.

The Texas Department of Water Resources regulates wells used for industrial waste disposal (including hazardous waste), for mining of minerals including uranium, copper, sulfur, sodium chloride, potash, and phosphate, and for various other purposes.

Chapter 27 of the Texas Water Code (the Injection Well Act) gives the Commission jurisdiction over Class II wells injecting "oil and gas waste," which is defined to include the disposal of salt water and other produced fluids, disposal associated with the underground storage of hydrocarbons, and injection arising out of, or incidental to, the operation of gasoline plants, natural gas processing plants, and pressure maintenance or repressuring plants. The Injection Well Act authorizes the permitting of wells for the disposal of salt water by injection into formations that are not freshwater sands.

Chapter 91 of the Natural Resources Code gives the Commission jurisdiction over Class II injection wells used for enhanced recovery of oil and gas and for underground hydrocarbon storage. Enhanced recovery wells inject fluids into formations productive of oil and gas.

The Texas Department of Water Resources assists the Railroad Commission by making recommendations to the oil and gas industry and to the Commission for the protection of usable-quality ground water during the exploration for and production of oil, gas, and other minerals.

Disposal Pits

Waste-disposal pits have been used in oil-production operations to store or evaporate oilfield brines. In 1969, the Railroad Commission prohibited by rule the unauthorized use of these saltwater-disposal pits, which damage the land surface and can cause groundwater contamination. Most oilfield brines now produced in Texas are reinjected into disposal wells, almost eliminating the use of pits for saltwater storage and disposal.

In 1983, the Legislature put restrictions on saltwater disposal pits into statute. Under the law (Natural Resources Code, Chapter 91, Subchapter K), the Railroad Commission may allow use of a disposal pit on a temporary, emergency basis, or allow use of an "impervious" disposal pit.

Abandoned Wells

There are an estimated tens of thousands of abandoned and unplugged or improperly plugged oil wells in Texas. Leaks through these abandoned wells can result in groundwater contamination, rendering water unfit for human or livestock consumption. They can also lead to saltwater breakout, contaminating the land surface and reducing soil productivity.

The Legislature in 1983 enacted a $100 drilling permit fee for any permit to drill, deepen, plug back, or re-enter a well, with the permit revenues earmarked for a new State Well Plugging Fund. The Well Plugging Fund is to be used by the Railroad Commission for plugging abandoned wells and for enforcement of laws or rules in relation to the Commission's authority to prevent pollution.

The Data Base: Railroad Commission Complaint Files

Our study of cases of groundwater contamination resulting from oil and gas exploration and production activities is based on information available in the Railroad Commission's complaint files. The Commission's Field Operations Section keeps a file summarizing pending and recently closed complaints, as well as a complete file on each complaint.

The Field Operations Section handles lease inspections and complaints regarding leases. The district inspectors try to inspect each lease once a year, but this is not always possible because of personnel and budget limitations. Complaints from outside comprise the majority of the matters on which district inspectors take follow-up action.

We reviewed the summaries of all 1789 complaints that were pending as of November 1984, as well as the summaries of 2869 complaints that were closed between January 1982 and November 1984 (these were the complaints filed alphabetically between A and K, approximately one-half of the total complaints closed). The results of this review are summarized in Table 1, which indicates the frequency of the principal types of complaints to the Commission:

TABLE 1
GENERAL SUMMARY OF COMPLAINTS TO RAILROAD COMMISSION: 1982-1984

Category	Pending Complaints No. of Cases	Pending Complaints % of Total	Closed Complaints No. of Cases	Closed Complaints % of Total
Abandoned Wells	608	34.0%	361	12.6%
Water Well Problems	93	5.2	183	6.4
Saltwater Pits--active	72	4.0	195	6.8
Other Pits (drilling, workover, etc.)--active	62	3.5	189	6.6
Abandoned Wells w/ Abandoned Pits	127	7.1	96	3.3
Surface Water Pollution	56	3.1	164	5.7
Saltwater Leaks from Pipes and Tank Batteries	50	2.8	166	5.8
Gas Venting, Flaring, Leaking, Odor	56	3.1	139	4.8
Oil Spill	47	2.6	134	4.7
Drilling Mud Dumping	37	2.1	120	4.2
Saltwater Dumping	46	2.6	100	3.5
Sales and Payments	43	2.4	99	3.5
Oil and Saltwater Spill	27	1.5	105	3.7
Abandoned Pits	51	2.9	70	2.4
General Production Related (logs, proration, reporting)	48	2.7	70	2.4
Saltwater Spill	26	1.5	84	2.9
Oil Leaks	19	1.1	76	2.6
Location or Lease Clean-Up; Exposed Flowlines	35	2.0	55	1.9
Pollution--general complaints	41	2.3	48	1.7
Lease Identification	25	1.4	45	1.6
Drilling or Vacuum Service Without a Permit	26	1.5	38	1.3
Spacing	27	1.5	32	1.1
Oil and Saltwater Leak	21	1.2	37	1.3
Drilling Fluid Spill	23	1.3	34	1.2
Faulty Injection Wells	20	1.1	31	1.1
Saltwater Breakout	17	1.0	26	0.9
Leaking Saltwater Disposal Wells	6	0.3	35	1.2
Seepage	18	1.0	22	0.8
Tank Sediment Dumping	5	0.3	29	1.0
Saltwater Disposal Without a Permit	21	1.2	7	0.2
Other	36	2.1	79	2.8
Total	1789	100.0	2869	100.0

Source: Railroad Commission complaint files. Table 1 summarizes all complaints pending as of November 1984, and complaints filed alphabetically between A and K that were closed between January 1982 and November 1984, about one-half of the closed complaint summaries. The categorization of complaints was developed informally by the researcher.

Confirmed Cases of Contamination

Of the 4658 complaint summaries reviewed for this study, 97 pending complaint summaries and 90 closed complaint summaries suggested possible contamination of ground water. These complaints mainly involved water well problems, faulty injection wells, leaking saltwater disposal wells, saltwater breakout, seepage, and disposal without a permit. The full complaint files for these cases were reviewed, to the extent the files were available and could be located by the researcher.

A reading of the full complaint files in these 187 cases revealed 69 confirmed cases of groundwater and/or land contamination--36 in pending complaints and 33 in closed complaints. (Since one-half of the closed complaint summaries were reviewed for this study, it might reasonably be inferred that the Railroad Commission files for 1982-1984 contain a total of roughly 100 confirmed cases of contamination from oilfield injection wells, saltwater pits, and abandoned and improperly plugged wells).

The majority of confirmed pollution cases occurred in a relatively small portion of the state--57% of the cases occurred in two of the Commission's 12 districts, in which a high percentage of production is conducted by small independent operators (see Figure 1). A large proportion of the complaints where pollution was found concerned the operations of small independents, with only 5 of the 69 cases traced to major oil companies. Twenty of the 69 cases involved operators that were unknown or no longer in business.

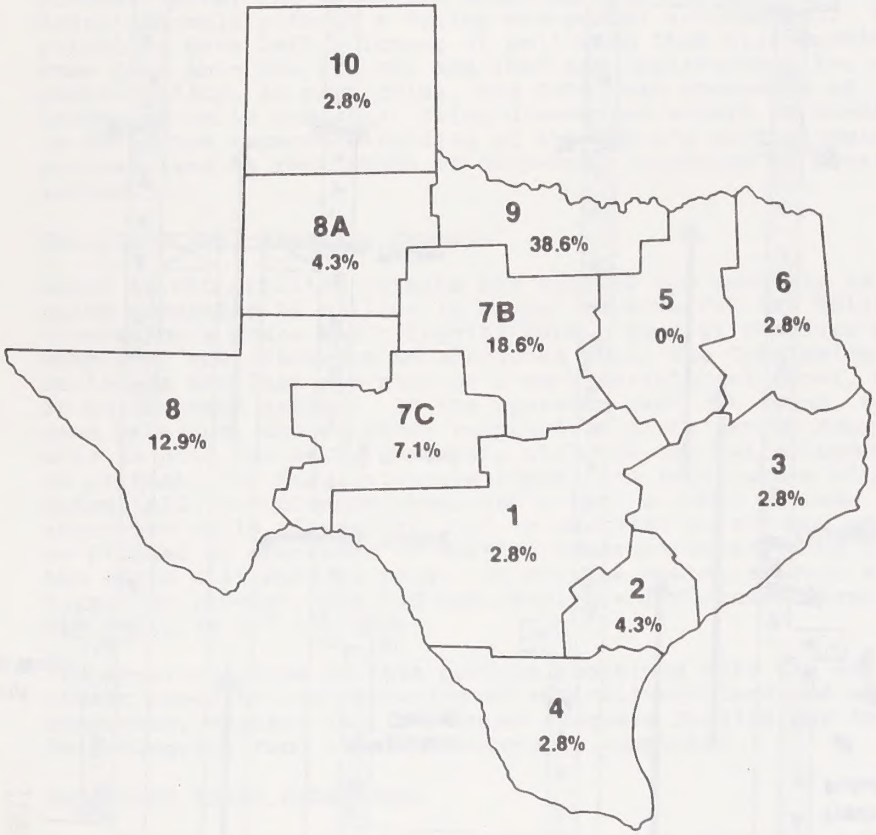
Only a small percentage, about 1-2%, of the total complaints received by the Commission appear to involve groundwater contamination. However, groundwater contamination cases are often more costly and serious than cases involving other types of complaints. Groundwater complaints stemming from the pollutionof water wells are the most numerous, but saltwater breakout, though less frequent, can also be a serious problem.

Because of the numerous sources of non-oilfield related water well contamination, less than one-fifth of the water well complaints proved on inspection to be related to oil and gas activities. Frequent non-oilfield pollution problems include sewage contamination, wells completed deeper than the base of usable quality water or with improper casing, and bacteria growth in the well.

When a water well is experiencing an oilfield pollution problem (typically, high chlorides), the pollution source is often difficult to track down. The source could be a leak in the casing of a disposal well, leakage behind the casing due to poor cement bond, old saltwater evaporation pits, or, most often, transport of contaminants through an improperly plugged abandoned well. Of the 30 water well complaints reviewed in this study where groundwater contamination from oilfield activities

Figure 1

Confirmed Land and Groundwater Pollution Cases - Distribution



District	1	2	3	4	5	6	7B	7C	8	8A	9	10
Confirmed Pollution Cases	2 (2.8%)	3 (4.3%)	2 (2.8%)	2 (2.8%)	0 (0%)	2 (2.8%)	13 (18.6%)	5 (7.1%)	9 (12.9%)	3 (4.3%)	27 (38.6%)	2 (2.8%)

Source: Railroad Commission complaint files. Figure 1 summarizes all confirmed cases of land and/or groundwater pollution that the researcher could locate in the files, based on a review of the 1789 complaints pending as of November 1984, and 2869 complaints that were closed between January 1982 and November 1984, about one-half of the closed complaints.

was found, in only two cases was the problem traced to a single injection well. Nine cases were attributed to saltwater communication between the injection zone and fresh water sands by means of improperly plugged abandoned wells. Another nine of the cases were attributed to the saltwater evaporation pits that were unrestricted in Texas before 1969.

One positive note is that, when the contamination was due to an improperly plugged well, the problem could be fixed by plugging the abandoned well properly. This procedure could cost $10,000-$20,000 in state funds in the typical case when the owner is long gone. (The average contract price for a well-plugging is $7000-$8000, but this does not include such costs as field work by district staff, attempts to identify and locate the operator, and administration).

The other major pollution problem, saltwater breakout, is closely related to water well contamination (see Diagram 2). When breakout is complained of, the inspection typically turns up a real pollution problem. Saltwater breakout takes place through an improperly plugged well completed into the injection zone. Usually these problems can be remedied, but the state often has to pay the plugging cost.

Faulty injection well complaints often concern injection down the casing, a violation of the requirement, since 1982, that the much safer tubing-packer arrangement be used in disposal wells (see Diagram 1). Regular inspections and pressure tests are the best way to insure proper functioning of injection wells. Since 1982, Underground Injection Control permit regulations have required annual well-monitoring reports to the Commission, and pressure tests on disposal and secondary recovery wells every five years. The operator monitors injection volumes and injection pressure with a monthly reading, and reports annually to the Railroad Commission, which does an annual inspection. The operator is exempted from the five-year pressure-test requirement if he reports the monthly annulus pressure of the well. When Commission district inspectors do go onto a lease and monitor pressure-tests of injection wells, they sometimes find casing leaks. For example, in one case when inspectors looking for the source of an oil seep tested several injection wells, they found casing leaks in two of the six wells tested.

The other groundwater pollution problem, seepage (see Diagram 2), is found to be oilfield-related in only a small percentage of cases. In four of the six cases when oilfield-related seepage was found, it involved wells that had not been properly plugged, through which the communication was taking place. In the other two cases, the seepage was due to single disposal wells. In those cases, the seep was stopped by reworking or shutting-in the well. However, since seepage can travel some horizontal distance, it may be difficult to confirm the origin of the problem.

Diagram #1

Injection Well with Tubing and Packer

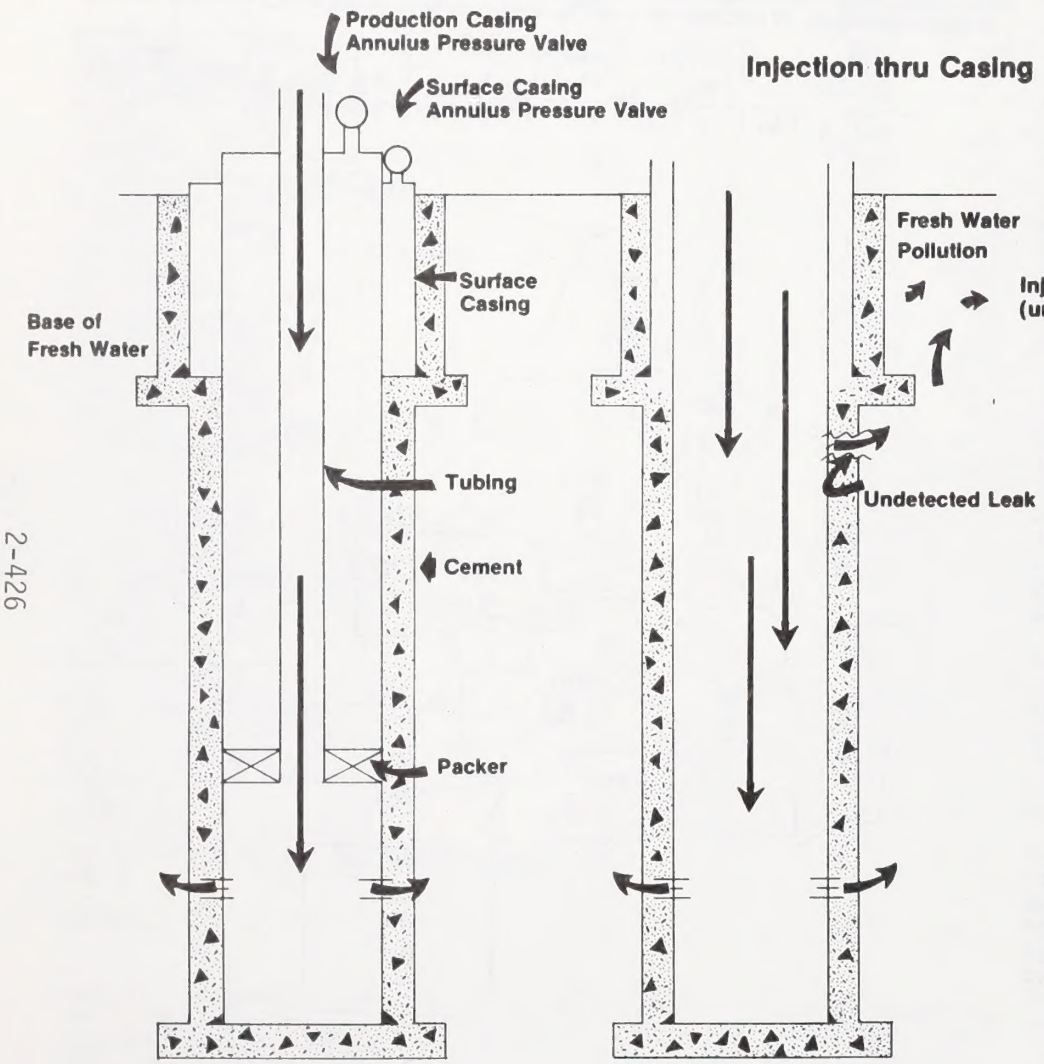
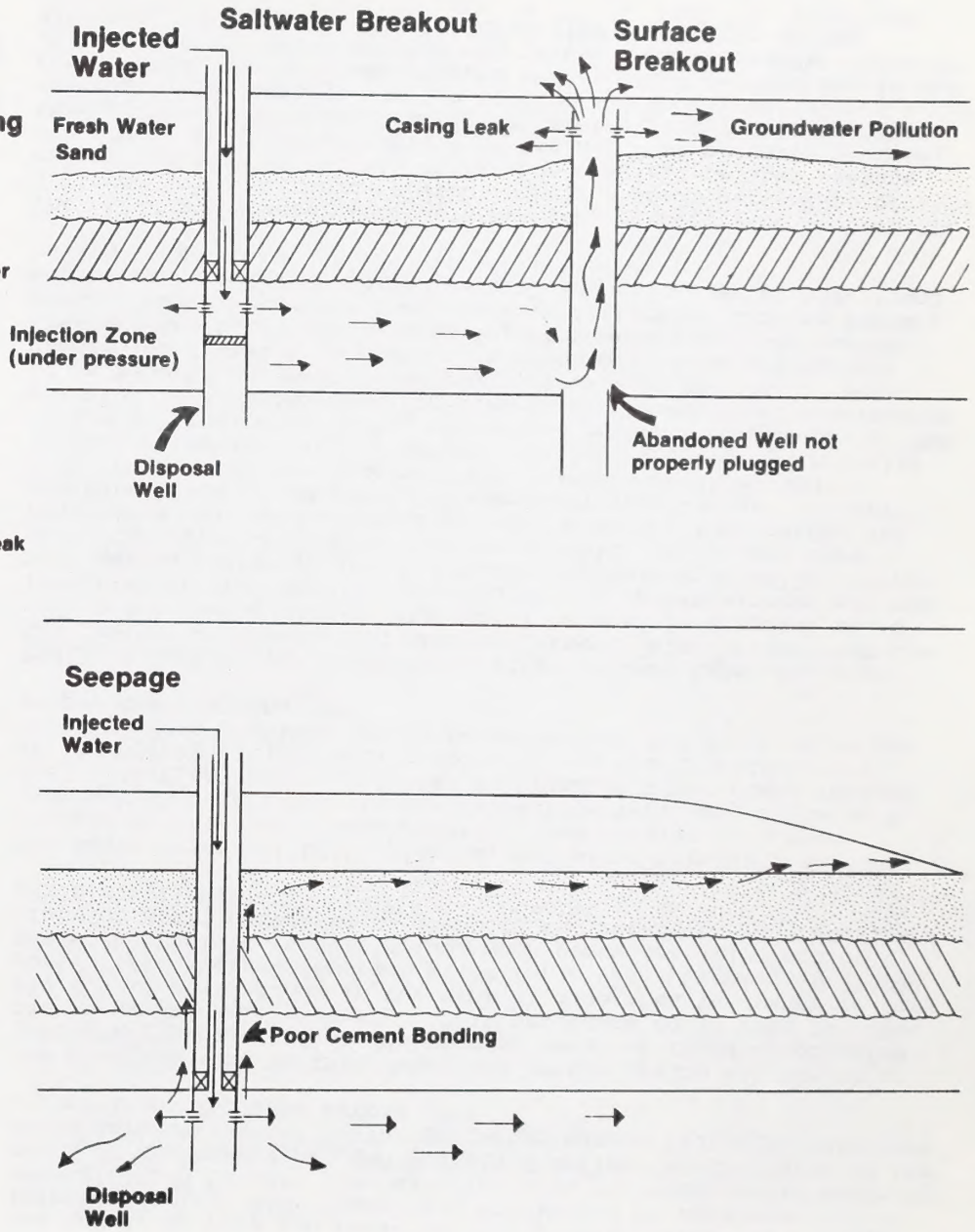


Diagram #2



Concluding Observations

Our review of the available evidence indicates that most of the problems of groundwater contamination resulting from oil and gas production activities stem from unsound past practices that are no longer permitted: abandoned and improperly plugged wells that are frequently not a part of the public record, saltwater disposal pits, and saltwater disposal down the casing of an injection well without a tubing-and-packer arrangement. These practices have left a legacy of pollution that will continue for some time into the future, and that has implications for current public policy. In particular, the fact that thousands of abandoned wells are still being discovered should be considered in decisions regarding funding of the state's well-plugging program, and in regulation of deep-well injection of hazardous wastes.

The State Well-Plugging Program

About 40,000 drilling permits are applied for annually in Texas, which generates $4 million in annual revenue for the Railroad Commission's State Well-Plugging Fund. When it receives a complaint and discovers an abandoned well, the Commission tries to locate the last operator or a working-interest owner, and do an enforcement action. If the operator can't be found, or has gone bankrupt, and no other responsible party can be found who is able to plug the well, the state will use the Well Plugging Fund. At present, the Commission has identified 1600 leases with potentially troublesome abandoned wells, a total of some 3000 abandoned wells altogether, and is checking to see how many can be plugged by operators or working-interest owners, and how many the state will have to plug. (A surface operator, such as a farmer or rancher, who did not receive any financial benefit from the well, is not liable.)

The apparent scope of this problem, combined with the serious threat posed by contamination of agricultural land and water resources, suggest that continued adequate funding for the State Well-Plugging Fund should be strongly supported.

Hazardous Waste Management

Much of the technology for constructing and operating injection wells used in oil and gas production has been transferred to wells used for deep-well injection of hazardous chemical wastes. Although this technology is well-established, faulty construction, improper operation, or deterioration of a well could lead to a failure of the hazardous waste injection procedure. There could be several potential contamination pathways resulting from a failure, such as upward migration of the waste liquid from the receiving zone along the outside of the well casing, escape into potable aquifers due to well-bore failure, and vertical migration and leakage through abandoned or improperly plugged wells in the vicinity.

A 1983 report by the Congressional Office of Technology Assessment noted that:

> upward migration of waste through abandoned or closed wells is particularly insidious because regions where waste injection is widely practiced also have a long history of energy exploration and development. Depending on the site geology, these wells provide vertical connections from deeper formations to near surface or surface formations. Many of these wells were drilled before plugging of abandoned wells was required. Often, their locations are not known and some may no longer be evident at the ground surface.

Hazardous waste injection well regulations require potential disposers to calculate the subsurface area expected to be affected by the pressure of waste injection. Before new waste injection can begin, the operator is required to survey and to plug existing wells within this area. The findings of our study suggest the state should be very cautious regarding the siting of hazardous waste injection wells in areas with a history of oil and gas exploration. If such siting is permitted, it should be done, among other requirements, only after a survey of the area to locate abandoned wells is conducted using the highest standards for precision and accuracy.

Examples of Groundwater Contamination Problems

The following partial listing of case summaries through November 1984 illustrates some of the problems brought to the attention of the Railroad Commission:

Water Well Problems

Hockley County, June 1982. Saltwater contamination in water wells was found to be caused by old disposal pits.

Clay County, October 1984. Complaint that unplugged well was making water wells go salty. Investigation found abandoned well, which was ordered plugged.

Ward County, May 1983. Water well was found to be contaminated as a result of problems with a saltwater disposal well and saltwater pits. The pits were backfilled and the well was plugged.

Clay County, June 1984. Complaint of water well contamination by nearby injection well. Investigation showed high chloride content in the well water, and casing problem with the injection well. Attempts to repair the casing proved unsuccessful, so the well was ordered plugged.

Hockley County, July 1984. Complaint of high chloride content in domestic water well. Investigation showed the problem was probably caused by an old saltwater disposal pit used until 1966.

Andrews County, July 1984. Unusually high chloride concentration found in water well. District personnel suspect old improperly plugged well nearby.

Midland County, August 1984. Analysis of water well sample showed a very high chloride concentration. The well is near the site of a previous complaint where it was determined that high chloride concentrations were caused by old backfilled saltwater pits.

Runnels County, March 1983. Unusually high chloride concentration found in water well. District personnel suspect a nearby abandoned well that was not properly plugged.

Schleicher County, September 1984. Good water well developed high chloride concentration. District office plans to request state funds to plug old abandoned well one-quarter mile away.

Scurry County, October 1982. High chloride concentrations in several water wells proved to be from several saltwater pits that had been used in the recent past. Chloride concentrations decreased significantly after the pits were backfilled.

Marion County, November 1984. High chloride concentration found in water well located 1000 feet from one injection well and 2000 feet from another. Commission is investigating the injection wells.

Saltwater Breakout

Callahan County, November 1982. Saltwater breakout was found to result from a well that had been re-entered for injection use. The well had been plugged originally in 1954. The well was re-plugged in 1983.

Wichita County, April 1982. Saltwater breakout problem was found to be due to a leaking injection well, which the operator was ordered to repair.

Throckmorton County, April 1984. Saltwater breakout found to be due to an abandoned well. Well had to be plugged with state funds.

Wichita County, December 1983. Investigation found salt water to be surfacing apparently as a result of breakout from an old well. Inspection also found unlined pits, abandoned wells, and no lease identification. The state spent $16,000 to plug six abandoned wells.

Shackelford County, September 1982. Complaint of saltwater breakout from injection well. Inspection found casing leak in injection well, which was repaired.

Palo Pinto County, July 1984. Investigation found oil and salt water coming up through an improperly plugged well. The water was coming from an injection well one-half mile away. The abandoned well was plugged with state funds.

Wichita County, February 1984. Oil and saltwater breakout found to be coming from an abandoned well. The well was to be plugged with state funds.

Archer County, December 1983. Salt water found to be surfacing from a saltwater disposal well. Disposal was discontinued in the leaking well until it could be reworked.

Wichita County, July 1983. Investigation showed saltwater breakout about 100 feet from a saltwater disposal well. The unidentified well through which the breakout was occurring was plugged with state funds.

Callahan County, May 1984. Inspection found leaking abandoned well causing saltwater breakout. Well was plugged with state funds.

Archer County, July 1983. Inspection revealed numerous unplugged wells and saltwater breakout. Commission required operator to plug the problem wells.

Archer County, November 1983. Injection of salt water into an unauthorized well caused saltwater breakout on adjacent property. Commission ordered injection stopped and well to be plugged.

Faulty Injection Wells

Stephens County, June 1982. Investigation of complaint found injection well not equipped with tubing and packer. Pressure test showed a leak in the casing. The well was reworked to bring it into compliance.

Gray County, January 1982. Gulf Oil enhanced recovery injection wells were found to be the source of groundwater pollution. Gulf spent $460,000 plugging abandoned wells and testing and repairing casings, and agreed to supply the complainant with an alternative supply of fresh water. In the end, Gulf's waterflood authority was rescinded.

Glasscock County, February 1984. Saltwater disposal well had to be plugged after a hole in the 4 1/2-inch casing was found.

Wichita County, October 1984. Complaint that operator was injecting saltwater down the casing, causing possible saltwater breakout. Operator was ordered to disconnect the injection until a proper tubing and packer arrangement was completed.

Jack County, April 1984. Complaint that saltwater was surfacing as a result of excessive injection. Inspection found saltwater surfacing between production and surface casing of an offset well. The operator's injection well was ordered shut-in to see what effect it would have on the offset well.

Wichita County, October 1984. Inspection found an inactive disposal well set for injection down the casing, and an active, through-tubing injection well seeping saltwater around the casing. The lease was sealed until it is brought into compliance.

Seepage

Shackelford County, October 1983. Investigation showed oil and salt water seeping into a stock tank. The seep stopped shortly after a nearby well was plugged.

Wichita County, October 1983. Saltwater seep was found to be due to an improperly plugged well, which allowed communication of fluids from three nearby injection wells. The well was replugged and the problem appeared corrected.

Caldwell County, March 1984. Investigation showed oil, gas, and mud surfacing from an abandoned wellbore and abandoned drilling pits. The pollution was stopped when the wellbore was plugged and the drilling pits were covered, at a cost of $19,000 in state funds.

Young County, February 1984. Saltwater surfacing near a residence was found to be due to an abandoned well. The well was plugged at a cost of $15,000 in state funds.

Howard County, June 1984. Seep area found in pasture near injection wells. The well identified as the probable cause of the problem is scheduled for plugging.

Mitchell County, April 1984. Investigation found saltwater flow to surface in pasture. After the injection well on the lease was reworked, the seep stopped.

 no date

Attachment to Letter 87

"Pipeline Oil Spills and the Edwards Aquifers, Central Texas" by Peter R. Rose. See Letter 66 for a copy of this article.

Old oil lines called peril to aquifer

Lack of safeguards, leaks raise threat

By Henry Krausse
American-Statesman Correspondent

The proposed All-American pipeline has drawn bitter opposition, including legal challenges, because it will cross the Edwards Aquifer recharge zone.

Environmentalists, landowners and local government officials want the pipeline stopped, or at least rerouted, because of the possibility — some say the likelihood — of an oil spill that could pollute the aquifer.

What often is overlooked is that 10 pipelines already cross the aquifer recharge zone and, according to researchers, pose a greater pollution threat because they were built decades ago without the extra safeguards that All-American has agreed to install.

Five crude oil pipelines and five pipelines carrying refined oil products like gasoline already crisscross the aquifer, which supplies more than a million people with their sole source of drinking water.

The pipelines are old and occasionally leak, sometimes near creeks and rivers that flow through the aquifer recharge zone in Medina, Bandera, Blanco and Hays counties.

Researchers point out that the spills are infrequent, and so far their effect on water quality has been negligible.

According to a 1976 Southwest Research Institute study, the pipeline failure rate over the recharge zone between 1970 and 1976 was seven times lower than for pipelines over the rest of Texas.

But the spills are still a nagging source of concern. If a leak is large enough and occurs at a bad place, the damage to the ground water supply "is likely to be severe," the authors of the 1976 study wrote.

The controversy surrounding the All-American pipeline has focused regulatory reform efforts on construction standards for new pipelines. At the same time, state agencies should consider improving maintenance and inspection rules for pipelines already in operation, said Tom Fox, one of the authors of the 1976 study and now the general manager of the Edwards Underground Water District.

"The risk of a leak is probably greater in the existing pipelines," Fox said.

Fox has collected leak reports filed with the Texas Railroad Commission that show most of the spills over the aquifer have been caused

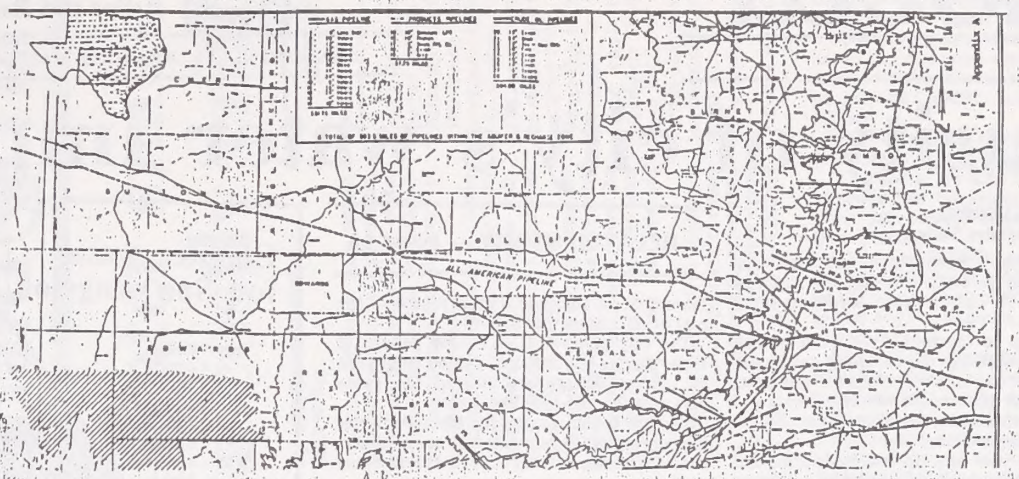
See Pipeline, A17

Expert voices doubts on pipeline

Guest Column

Editor's note: Dr. Peter R. Rose is an independent consulting geologist with more than 25 years experience in petroleum exploration and development. He and his wife, Karen, live and work in the southwest part of Kimble County where they operate their consulting business, Telegraph Exploration Inc., as well as their ranch, El Segundo. In 1967, Rose carried out a geological mapping project in the eastern Edwards Plateau, focused on the Edwards limestone and covering most of Kimble, Edwards, Real, Kerr, Gillespie, Bandera and Kendall counties, by coincendence, the area impacted by the proposed All-American hot-oil pipeline. His work was published in 1972 by the Texas Bureau of Economic Geology as Report of Investigations No. 74, "Edwards Group, Surface and Subsurface, Central Texas." It has since become the standard reference work on the eastern Edwards Plateau and establishes the geological basis for understanding the natural ground-water system of the Edwards aquifer in the area.

By DR. PETER ROSE
Consulting Geologist



In my opinion, the expressed concerns of some landowners in the area about the danger of ground-water contamination from spills from the proposed All-American pipeline are entirely justified.

I believe that Kimble County Judge Wilbur Dunk and the County Commissioners acted very wisely in tabling any further pipeline activity pending further investigations. I would go farther, however, and make four additional observations:

•The danger of ground-water contamination does not just affect those landowners across whose property the pipeline right-of-way extends. On the contrary, a serious oil spill that percolated downward to the Edwards aquifer could be expected to contaminate water supplies over wide areas and could even spoil permanent springs and, ultimately, find its way into our creeks and rivers. Unfortunately, it would be almost impossible to eradicate oil pollution within the Edwards aquifer — once a spill had occurred, only time, dilution, and gradual dispiersal of the hydrocarbons in the ground-water could accomplish that. Meanwhile, water supplies could be contaminated over a period of several years. Contamination could affect one well, or many wells and springs over a wide area, depending on the severity of the oil spill.

•I have personally become increasingly disturbed during the past few weeks by the attitude of the All-American pipeline representatives, as reflected in numerous newspaper reports and my discussions with knowledgeable citizens. What is conveyed is the appearance of poor planning, organizational disarray, lack of the most basic environmental concerns, and even a certain disregard for Hill Country residents. In my experience, the firms that have manifested such attitudes frequently are also the same firms who carry out second rate construction projects, the classes of projects that are plagued by accidents and malfunctions. The symptons are clear to me: I believe All-American is not carrying out adequate environmental planning measures, and I am apprehensive that there is a high likelihood of serious oil spills from the pipeline.

•Even though it is true that the chance of an oil spill at any one time and in any one place is very low, the probability of such a spill occurring somewhere along the 150-mile Hill Country stretch of the pipeline, over a long period of time, becomes much higher. By analogy, the chance of a certain baseball player pitching a "no-hitter" in any one game is quite low, but the chance of someone throwing a "no hitter" sometime during the entire season is quite high. For that reason, one is probably justified in predicting that there will be some leaks. Unfortunately, the consequences of such leaks, particularly if they are not immediately controlled, are unacceptable.

•Even though Kimble County badly needs the additional tax revenue that the pipeline would supply, I personally do not think those tax dollars are worth the risk of serious ground-water contamination. I am certain that additional safeguards can be engineered into the pipeline design which will reduce the chance of a pipeline rupture and also greatly limit the amount of oil spilled in case of an accident. Such safeguards will doubtless add cost and cause delays to pipeline construction and, of course, All-American will be resisting such added cost. However, I am sure that such safeguards will not cause All-American to halt or divert the project.

Some people may be interested in knowing a little more about the Edwards acquifer in Kimble County.

The Edwards Limestone forms the steep cliffs and bluffs, such as "Lovers Leap" east of Junction, that border the valleys of the North and South Llano Rivers and Johnson Park. The upper part of the Edwards also forms the high divide country in the western and southern parts of the County. The Edwards is about 450 feet thick.

The soft, yellowish and reddish clay strata in the valleys below those cliffs are the Glen Rose formation. The Edwards is porous and permeable, but the underlying Glen Rose is tight, or impermeable. As a result, rain water seeping downward into the porous limestone accumulates in the lower part of the Edwards, because it cannot move further downward through the Glen Rose.

The thickness of this water-column varies, but it may be as much as 250 feet thick in some places. This water percolates sideways through the lower Edwards, following the gentle slope of the strata, and comes out along the river valleys as permanent springs, such as "700 Springs," issuing from the base of the limestone cliffs. Most of our upland water wells pump water, from the Edwards aquifer, and all of our rivers and creeks are

Please see PIPELINE, Page 7B

LETTER 87 (CONTINUED)

Pipeline From A1

by external pipe corrosion, a sign of old age in metal pipe.

According to the reports:

• Some sections of an Exxon pipeline crossing the aquifer in Medina County are 59 years old. A leak that spilled 100 barrels of crude oil there in 1982 was blamed on corroded pipe.

• The worst pipeline accident in the recharge area occurred in Medina County about 18 miles north of Hondo in 1981, when a 31-year-old line owned by American Petrofina (Fina) Pipeline Co. spilled 2,500 barrels of oil. The cause was corroded pipe. The spilled oil "evaporated," a company official reported.

• Corrosion on the Fina pipeline also caused a 150-barrel spill in Real County a few months later. "Most of the oil has soaked into the ground. Presently picking up what can be picked up," a notation on the report said.

• A gasoline line owned by Texas Pipeline Co. was accidentally ruptured in 1983 by a heavy equipment operator a mile and a half southwest of Buda in Hays County. A repair crew for the Hearne-based company fixed the leak after a loss of 10 barrels. The pipeline is 38 years old.

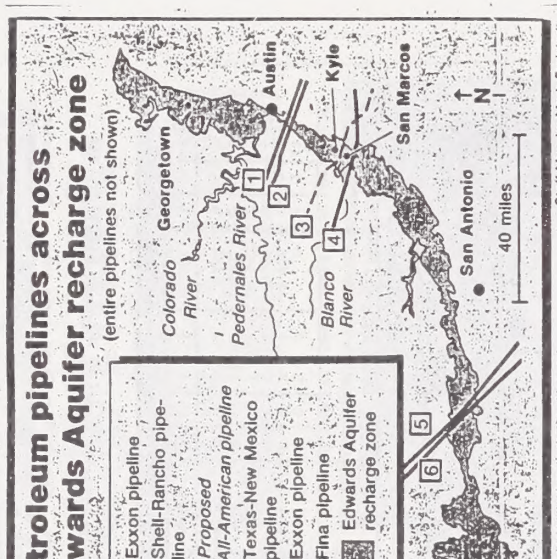
A dozen natural gas pipelines also thread their way across the aquifer recharge zone, but they are not considered a water pollution hazard.

Early this week, Travis and Hays counties asked for a court order to stop work on the All-American pipeline east of McCamey in West Texas. The 30-inch conduit would stretch from California to a refinery at Webster, near Houston.

Although a state district judge last month ordered the Railroad Commission to adopt new anti-pollution regulations before it rules on the company's application for an operating permit, All-American officials said they would go ahead with construction with or without the permit.

In arguments against the proposed pipeline at a Railroad Commission hearing in December, opponents pointed to the track record of the older pipelines, citing a prediction in the 1976 study of at least one minor leak over the recharge zone per year.

Fox said the predicted pipeline failure rate has held steady through 1984.



Staff Map by Mark Freistedt

In January, All-American agreed to construction and maintenance safeguards proposed by the water district to prevent or trap leaks over the recharge zone, including a clay liner underneath the pipe.

Even with the voluntary safeguards, the All-American pipeline would not be leakproof, said Dr. Glenn Longeley, director of the Edwards Aquifer Research and Data Center, a scientific arm of Southwest Texas State University in San Marcos.

"Clay can crack. It's not foolproof," Longeley said.

But the safeguards would make the new pipeline less dangerous to the aquifer than the older ones, Longeley said.

"I'm not sure anything can be done about the existing lines. I guess it's the responsibility of the Railroad Commission," Longeley said.

Present pipelines are subject to U.S. Department of Transportation standards, which the Railroad Commission has adopted. Fox said he considers them inadequate.

A Railroad Commission spokesman said he did not know if the commission will toughen inspection standards for the current lines when it begins to adopt stricter construction rules.

"I'm sure it will be discussed. I'm not sure whether that's going to be included in our rule-making, or not," said the spokesman, Brian Schalbly.

Purity of city's water improves

By LE KILLGORE
Political Affairs Editor

Water, water everywhere, and each drop tastier than the last, with only the slightest addition of costly and less-than-tasty chemicals.

The drop in chemical treatment of San Angelo's water and the resulting savings in money are the direct results of generous rains on the San Angelo watershed over the past several months, said San Angelo Public Works Director Cloice Whitley.

Just one year ago, on March 9, 1986, San Angelo's three lakes topped off at a skimpy 42,294 acre-feet.

An acre-foot is 325,800 gallons of water. San Angeloans use about 15,000-16,000 acre-feet a year.

To preserve that shrinking resource, San Angelo water officials were taking between 50 percent and 60 percent of each day's water supply from Lake Spence near Robert Lee.

The nasty taste of a drought-stricken water supply comes from the presence of large amounts of chlorides, sodium and dissolved solids.

The department's budget for the 1986-1987 fiscal year has earmarked $180,000 for chemicals to treat the water.

For first four months of the fiscal year — October, November, December 1986 and January 1987 — actual expenditures for chemicals were $36,000 instead of the $45,000 estimated for that period.

For the first four months of the previous fiscal year — October, November and

RELATED STORY — Page 1A

December of 1985 and January 1986 — the cost of chemicals was $53,696.

The city pumped 1,365,849,000 gallons of water during the 1986-1987 period compared to 1,516,145,000 gallons during the same period in the 1985-1986 fiscal year.

In other words, during the first quarter of the current fiscal year, the city spent 49 percent less money to treat 11 percent less water used.

"The choliform count on O.C. Fisher is down almost to the point where there's hardly any at all, so we're using half as much chlorine and ammonia as we did last summer," he said.

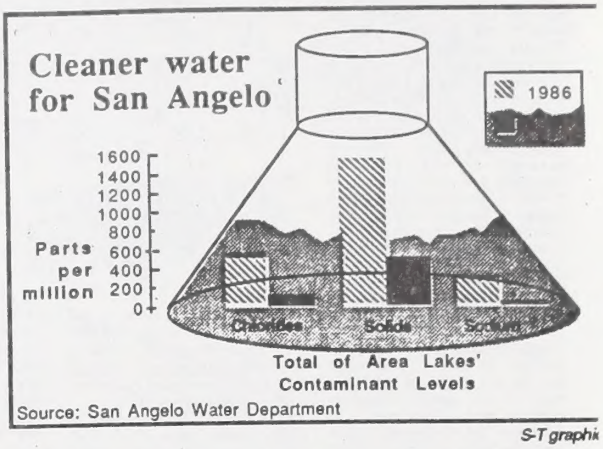
The turbidity — dirt from the lake beds that mingles in with the water as it travels to the treatment plant — is running between 5 parts per million gallons and 6 parts per million.

Last year, Whitley said, during the worst times, when the lakes were their lowest, the turbidity measured out at 35-40 ppm.

Chlorides are running about 40 ppm, compared to a top reading of 780 ppm last summer.

During February 1986, Whitley said, San Angelo water contained 536 ppm of chlorides, 296 parts per million of sodium and 1,531 parts per million of total dissolved solids — "none of it good," Whitley added.

On Monday, March 9, San Angelo's lakes held 190,986 acre-feet. In other words, there



S-T graphic

was 149,692 acre-feet more than the supply of a year earlier.

Chloride content is 116 ppm, almost four times better than last year; sodium is 32 ppm, almost 10 times better than last year; and dissolved solids "a mere 505 parts per million, which is three times better than last year," Whitley said.

About 60 percent of the water coming through the taps today comes from O.C. Fisher Reservoir. No water has been taken from Spence since early in October 1986.

"Our treated water analysis for the month of February improved almost 150 percent due to better water in Nasworthy, Twin Buttes and O.C. Fisher," Whitley said.

Whitley's conclusion: "The quality of water now enjoyed in San Angelo is comparable to most East Texas cities. Not many West Texas cities can even come close. San Angelo now has more and better water stored in its three lakes than at any time the past 10 years."

LETTER 87 (CONTINUED)

PIPELINE

Continued from Page 6B

fed from Edwards springs. The city of Junction (as well as Kerrville, Fredericksburg, Comfort, Blanco and Boerne) takes its water supply from such streams.

One of the most important aspects of the Edwards aquifer is that, because of its high porosity and permeability, rain water and run-off water move downward to the saturated ground-water table very rapidly — within hours or days.

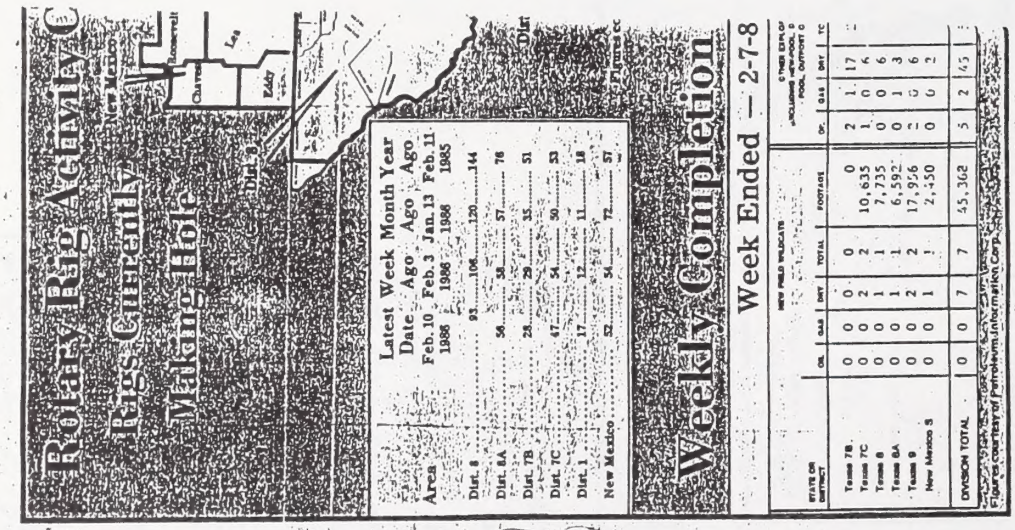
Lateral movement of ground water is also fairly rapid, by geological standards, at rates on the general scale of a few miles per year. This becomes especially significant when we consider the possibility of a large oil spill, because the oil would also move quickly downward into the aquifer and then accumulate on top of the water column. So, the available time in which to halt such damage is very short indeed.

Moreover, once the oil is in the aquifer, there is no effective way to remove it.

The Edwards aquifer in the Uvalde/San Antonio/New Braunfels/San Marcos/Austin belt is a separate, but related system. It is formed where porous Edwards Limestone is present in fault-blocks of the Balcones Fault zone. Here, the water moves laterally, confined within the fault-blocks, eastward and northeastward through the Edwards.

Area streams flowing eastward and southward over the faulted Edwards outcrops, such as the Blanco, Guadalupe, San Marcos, Medina, Sabinal, Frio, and Nueces Rivers, charge the Edwards with their stream water.

Communities in those areas have expressed increasing concern over the past few years over the protection of this "other" Edwards aquifer, in the form of rigorous zoning and water usage regulations. In the past, such regulations have not seemed necessary in the Hill Country because of our predominant agricultural and recreational land use and low population density.



Commission levies fines against W.

AUSTIN — Several West Texas leases were named by the Railroad Commission in fining a total of five Texas oil and gas operators $25,000 in penalties.

More than half the total, $14,000, went to Abilene operator B.D. Click Co. Inc.

Penalties lev a well on the B well on the Di $3,000 for a w County; and $ Jones County.

Friday, March 27, 1987 — 36 pages

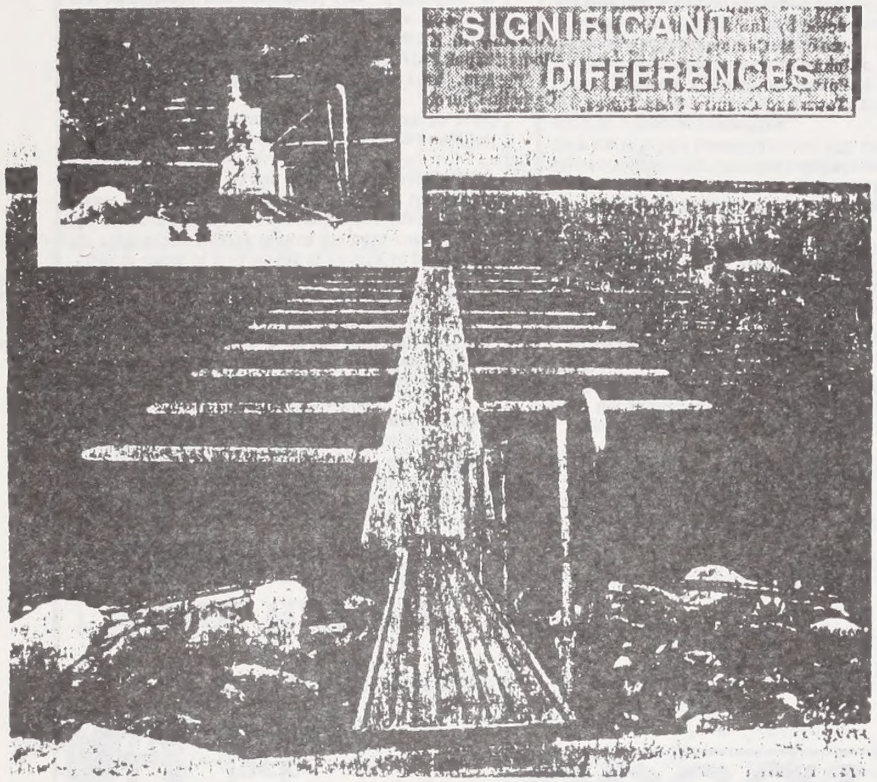
TUBAS — ASU students determined to expand the big horn's oompah image — 1B

WHEELCHAIR — Fraternity members start 200-mile fund-raising trip for liver patients — 1C

S.A. RELAYS — Many of the best competitors expected for 2-day meet — 1D

San Angelo **Standard Times**

VOL. 67, NO. 56 — Serving West Texas since 1881 — 35 Cents



S-T photos by David Tillery and Joe Abell

Photographs of a boat dock at Twin Buttes Reservoir show the difference a little rain can make over time. In May 1986, the water was low enough to leave the dock on the ground and allow brush to grow over it. Thursday, the dock was afloat in an expanse of blue.

Lake levels break record

San Angelo's lakes held more water Thursday than at any time in the past 10 years, according to City Manager Stephen Brown.

Total content for the three reservoirs was 200,122 acre-feet.

In addition to shattering that 10-year record, Brown said, Twin Buttes Reservoir measured 120,189 acre-feet Thursday morning, its highest in eight years.

Lake Nasworthy held 10,652 acre-feet and O.C. Fisher Reservoir contained 69,281 acre-feet.

RELATED STORY — 1C

By contrast, less than a year ago on May 7, 1986, the lakes hit a 15-year low, with a total of 38,312 acre-feet.

One acre-foot is about 325,800 gallons.

San Angeloans use between 15,000 and 16,000 acre-feet a year, with a nearly equal amount lost to evaporation.

Wednesday, March 25, 1987 — 32 pages

ROBERTS — Cowan throws in towel; says adios to Oral and Biloxi, Miss. — 1C

REFORM — Immigration law may be unpopular but employers must live with it — 1C

SMU — Mustangs — Private eye to study sex scandal; Clements waits for call — 1D

San Angelo **Standard Times**

VOL. 61, NO. 94 — Serving West Texas since 1934 — 35 Cents

Water snake is a costly critter

By REX HENDERSON
Staff Writer

Sponsors of Stacy Dam agreed last week to spend up to $3.7 million to protect the Concho water snake, a threatened species surviving in the Concho and Colorado rivers at the site of the dam.

Based on a estimates of Concho water snake population made in the early 1980s, the agreement commits the dam builders to spend more than $4,600 per snake.

Biologists have counted about 800 snakes surviving in the shrinking range from San Angelo down the Concho to below the dam and from Robert Lee down the Colorado River.

The Colorado River Municipal Water District, primary sponsors of the dam, pledged the money in a memorandum of agreement signed in Washington, D.C., by CRMWD General Manager Owen Ivie and Director of the U.S. Fish and Wildlife Service Frank Dunkle.

INSIDE — 1C

•See related story.

The memo represents a formal commitment by the CRMWD to execute all of the Fish & Wildlife Service's recommendations for protection of the snake that threatened to stop Stacy Dam.

According to Ivie and a federal spokesman in Fort Worth, the memo contains no new requirements that have not been made public in a Fish & Wildlife Service biological opinion released last December, except the spending figure.

For the first time, it commits the

Please see SNAKE, Page 4A

SNAKE

From Page 1A

CRMWD to a specific amount of money for the water snake.

CRMWD President John Taylor said in January the board had discussed spending up to $5 million on the snake. Another source, who wished to remain unnamed, said the CRMWD had been prepared to spend $4.7 million.

Ivie denied that Tuesday. "We never expected to spend more than $3.7 million," he said.

"Of course, we didn't expect at the outset to pay anything (for the snake)," he said. "But taking all things into consideration, we were satisfied with that (the outcome)."

Without a CRMWD agreement to protect the snake, the federal Endangered Species Act might have blocked the construction of Stacy, which will supply water to San Angelo, Midland, Abilene, Odessa, Big Spring and Snyder.

Ivie said the money for the snake habitat will come from the proceeds of a bond issue established last year for construction of the dam.

Because the winning bid on construction was $6 million below estimates, the district can pay for the snake habitat and other unanticipated expenses and remain within the bond proceeds.

The CRMWD is paying for archeological excavation and land litigation that were not expected when the bond issue was written.

The memo awaits the signature of one more official, Army Corps of Engineers Regional Director Col. Albert Gennetti of Fort Worth. If Gennetti signs the document, as expected, it will become a part of the federal permit allowing the dam construction to go forward.

The Fish & Wildlife Service biological opinion said that the dam could drive the snake into extinction unless the builders take pains to improve the snake's remaining habitat.

The CRMWD will be required to improve 79 miles of Colorado River habitat, to hire a full-time snake biologist, to build snake habitat along the shore of the reservoir and to nurture the snake in existing habitat among other things.

The Fish & Wildlife Service will share the expense of continued study of the snake in an amount not to exceed $30,000 per year for five years or half the cost of the study, whichever is less and assuming Congress allocates the money.

If the cost of snake protection exceeds $3.7 million, the CRMWD and Fish & Wildlife will go back into negotiations on the issue, Ivie said.

2-433

Local

Inside C Section Classified /4-8C

SAN ANGELO STANDARD-TIMES—Wednesday, March 25, 1987—1C

Brown & Root given Stacy contract

By REX HENDERSON
Staff Writer

Directors of the Colorado River Municipal Water District Tuesday voted to award the Stacy Dam construction contract to Brown & Root, the low bidder for a water impoundment project that will provide water to six West Texas cities, including San Angelo.

RELATED STORY — Page 1A

Brown & Root of Houston, one of the five largest construction companies in the world, underbid its nearest competitor by $6 million with a $30.7 million offer on March 5.

The vote Tuesday authorized the president of the CRMWD, John Taylor of Big Spring, to sign a contract with Brown & Root as soon as the district receives a federal permit from the Army Corps of Engineers to build the dam, and provided the permit contains no surprises.

A Corps of Engineers spokeswoman, Sally Werst, said Tuesday she expects a decision on the permit April 6.

"We see no problem with that date," CRMWD General Manager Owen Ivie said. He had been expecting the permit next week. "We'll move on with conferences with the contractor, and make sure each side understands what each is expecting."

Ivie said the contract can be prepared and signed by the contractor before issuance of the permit, leaving it ready for Taylor's signature.

Construction will begin 10 days after Taylor signs the contract, Ivie said.

"Shortly, we will discuss a date for groundbreaking," he said.

Ivie said that the CRMWD staff and Freeze and Nichols engineers have been scrutinizing the Brown & Root bid to ensure it complies with bid specifications.

"We are satisfied about the questions we had," Ivie said.

The Houston contractor was able to underbid its competition because of its expertise in rock excavation and because they will use local material on the upstream face of the dam, Ivie said.

Brown & Root will build the dam with rock and soil mined in the lake bed or nearby, Ivie said. Other contractors intended to haul in construction material, he said.

The CRMWD, with member cities of Odessa, Big Spring and Snyder, is the managing partner for Stacy Dam.

The cities of Abilene, San Angelo and Midland each will pay 16.54 percent of the cost.

Stacy will cost about $65 million, and will be paid for by a bond issue. Dam construction will be less than half of the total cost. Land purchase, road relocation, engineering and protection for the threatened Concho water snake will cost another $30-million plus.

Inside C Section Classified /4-10C
• Local, area news / 2C,4C
• For the Record / 4C

SAN ANGELO STANDARD-TIMES—Friday, March 27, 1987—1C

Local

Jack Cowan

Dam habitat sheds dollars

Somehow, it had never completely sunk in until now; it was just a lot of big numbers. I knew that, in order to get approval of Stacy Dam, the Colorado River Municipal Water District had to promise to build a habitat to protect the Concho water snake. As it turns out, the cost is $3.7 million.

That comes out to about $4,600 per reptile.

This is causing some very strange thoughts to go through my mind. I'm glad the lake will be built, and I suppose most people in the cities that will be served would be willing to spend nearly any amount of money to ensure it.

But to think of it in terms of having to pay $4,600 for each snake nearly makes my skin shed. I hope it's someone else's money going for that and not mine. I'd rather my dollars be paid to the laziest person who works on the dam than to building the habitat.

I hate snakes. All kinds. I couldn't sleep at night if I thought I were actually paying money to build them a nice home.

According to estimates made a few years ago, there were about 800 of the snakes in the river areas that will be affected by the dam. I suppose that's what makes them an endangered species, which, to my admittedly non-ecological way of thinking, is the best species of snake.

I know that I'm not the only one disturbed by this revelation. I have heard people say they're so angry they'd like to go out and shoot the snakes.

Please don't do that. As much as I like hearing about dead snakes, I recognize that killing them would only make things worse.

Say a lot of guys went out with their .22s and shotguns and killed half of the Concho water snakes. That would mean the cost of building a habitat would be over $9,000 per snake, which would be even more unbearable. Instead, we should be hoping that the habitat is so wonderful that they make thousands of baby snakes, driving the dollar value of each critter down to a more acceptable level.

(This idea is contingent, of course, on a guarantee from the snakes that they will not stray from their habitat to any place that I might have to look at them.)

In the meantime, at $4,600 per snake, I feel like we ought to do something to make them seem more valuable to us. Perhaps we could give all of them names. It might be easier to accept giving money for the project if we could know that our dollars were going toward building a home for, say, Thurman.

Maybe some of the less finicky souls could even become friendly with a few of the snakes and visit them occasionally. Once the habitat was completed, they could take a housewarming gift, perhaps a nice stick or a frog or something.

It will be easier to accept the high price tag if we take that sort of attitude. Another way of looking at it is that we might be able to promote the situation and make some of our money back.

Where else could you find snakes worth $4,600? I suggest that tours be arranged and a little souvenir shop set up. A lot of people would pay $10 for a T-shirt that said, "Longnecks and $4,600 Snakes — Nowhere but Texas."

With this kind of ammunition, our state legislators should have no trouble at all getting the Concho water snake declared the state reptile, creating further tourism possibilities.

While I can't say I'm pleased about spending so much money on something that slithers, I believe that now it's up to us to make the most of the situation. Consider it an opportunity so that, one day years from now when you go to the new lake, you can look out on the water with no regrets. And while you're out there say hidy to Thurman for me . . .

LETTER 88

March 29, 1987
HARDY TURNBO
RT. 6 BOX 313
SAN ANGELO, TX. 76904

Mr. William Haigh
BLM Project Manager
1695 Spruce St.
Riverside, Calif. 92507

This letter is in regard to the Environmental Impact Statement concerning the All American Pipeline project.

88-1 I feel this statement does not give enough serious study to the sensitive area around an including the South Concho river. This river supplies the drinking water for the city of San Angelo. A leak here would be very serious.

88-2 Many areas around the town of Christoval are practially solid rock and will have to be blasted. Water wells in the area are scarce and blasting could cause these wells to become useless thus ruining a persons land and possibly his means of living.

88-3 I would suggest at least a 30 day extention be granted for more written testimony and study.

88-4 I would like to have the Stacy Dam declared a sensitive area since that project has received final approval, and have clarified exactly what protection will be provided for the Concho Water Snake.

Respectfully,
Hardy Turnbo

RESPONSE TO LETTER 88

88-1 Your comment concerning drinking water is noted. Please refer to the response to Comment 6-4.

88-2 Your comment concerning blasting is noted. Please refer to the response to Comment 6-2 on blast design.

88-3 Your comment concerning an extension of the public comment period is noted.

88-4 Your comment regarding this issue is noted. For the Northern Alternative, the Draft SEIS considered the construction and operation of the Stacy Dam on the Colorado River particularly in regard to potential impacts to the Concho water snake. Concho water snake impacts were further addressed in the Biological Assessment prepared for the All American Pipeline under Section 7 of the Endangered Species Act. The USFWS is preparing a Biological Opinion under that act which will address the concern of Concho water snake impacts and any required mitigation measures; please see also the response to Comment 87-4.

LETTER 89

March 29- 1987

George DeWolf
Rt-6-313-A-
San Angelo, Texas
76904

Mr. William Haigh
B.L.M. Project Mgr.
1695 Spruce St.
Riverside Calif.
92507

This letter is in regards to the Draft Supplement Environmental Impact Statement.

I think the book need to understand more about
89-1 The land in this area, because there is water ways and rock formation in this area has many old wells that is or may not be pluged in the proper matter. If there is alot of blasting and construction you may disturbe water well that livestock need and people.

89-2 Also the land takes anywhere from 10 to 15 years to complete get over this kind of construction. The

89-3 Blue book need understand all of this. The pipeline is crossing two of (San Angelo, Texas) (Tom Green County) water ways South Concho River, and Pecan Creek. This is San Angelo's drinking water.

Mr. William Haigh I my self ranch in this area and feel that I know alot about the land and rock formation and also water wells and water ways.

89-4 Also the Stacy Dam site should be also a sensitive area and the Concho water snake is endangered species. Also

89-5 The Christoval area needs to be a sensitive area, because of the water and the formation of the land

RESPONSE TO LETTER 89

89-1 Please refer to the response to Comment 6-2 regarding blast design.

89-2 Your comments and concerns regarding reclamation are noted. Please refer to the response to Comment 87-6.

89-3 Please refer to the response to Comment 6-4 for a discussion of oil spill effects on surface water supplies.

89-4 Your comment regarding this issue is noted. Please refer to the response to Comment 87-4.

89-5 Several features in the Christoval area, including the South Concho River and the Edwards-Trinity Aquifer, are considered sensitive features. Please refer to Map 2-3, Sheet 2 in the Draft SEIS for further information.

LETTER 89

PAGE 2.

89-6 Mr. William Haigh, We The people OF This AREA Christoval, South Concho River And PECAN CREEK And San Angelo, Texas. Think you should give us 300 days or Even 60 Days more Time To get Everthing Together, Like we need To

Thank you

George DeWolf
RT-6-313-A
San Angelo, Texas
76904

RESPONSE TO LETTER 89

89-6 Your comment concerning an extension of the public comment period is noted.

LETTER 90

Christoval, Texas
March 30, 1987

Attention: Mr. William Haigh

Dear Sir,

90-1 As a tenant on the Don Ray Ranch, Tom Green County, Texas, I would like to second the property owner's concern that the E.P.I. study is vague pertaining to the treatment of the land after the pipeline has been completed. Bare ground in this particular area, once the grass is removed, lends itself to invader plants and toxic weeds such as whorehound and kittenweed. Some plan for control of these undesirable plants should be made for 2 growing seasons following disturbance of the ground. This should be followed by a native grass reseeding program.

My experience with other pipelines on this property for the past 30 years leads me to this conclusion.

Thank you,
Pip Van Court

Box 29
Christoval, Texas
76935

RESPONSE TO LETTER 90

90-1 Your comments and concerns regarding reclamation are noted. As stated in Section 2.2.2.10 of the Draft SEIS and Mitigation Measure S-1 in Appendix A of the Final SEIS, restoration programs would be based on agency and landowner guidelines developed prior to construction activities. The Authorized Officer, local SCS revegetation specialists, and landowners would interact to develop the most effective means of revegetating and controlling erosion along the ROW. As part of the maintenance program, an aerial reconnaissance along the entire pipeline ROW would be conducted at least every two weeks. During these surveys, revegetation and erosion control success would be monitored. Mitigation measures would be employed for problem areas identified.

LETTER 91

Fay Swafford ORIGINALS

29 March 1987

Mr. William Haigh
B.L.M. Project Mgr.
1695 Spruce St.
Riverside, Ca. 92507

Dear Sir:

I am writing in regard to the Draft Supplemental Environmental Impact Statement with the All American Pipeline project in mind.

I am a landowner in the Christoval area and am very well aware of the fragil "ecco" conditions of our land. I feel that more study should be conducted on safety measures in construction and operation proposals before the line is approved.

91-1

Our area is rocky & mountainous and our water comes from small wells & springs which would be severly damaged by construction of such a pipeline. We of the Christoval area feel that

91-2

2-439

RESPONSE TO LETTER 91

91-1 Please refer to Appendix A in the Final SEIS for mitigation measures addressing system safety.

91-2 The South Concho River is considered sensitive, and it was recommended in the Draft EIS that remote-control block valves be installed at the crossing. The remote-control block valves will reduce the volume of any oil spill. Please refer to the response to Comment 6-4 for impacts to the South Concho River from an oil spill.

The Northern Alternative crosses the Colorado River below the proposed Stacy Reservoir. The pipeline crosses the headwaters of a few small drainages that flow into the proposed reservoir. It is anticipated that impacts to the proposed reservoir would be minimal.

Please refer to the response to Comment 6-13 and the revised Mitigation Measure G-1 in Appendix A.

LETTER 91

Fay Swafford ORIGINALS

91-2 Cont.

not only should the South Concho be considered a sensitive area but that the entire watershed, including Stacy dam, be included.

Furthermore, we respectfully request that the deadline for written testimony be extended 30 days.

Respectively

G. W. James

Box 134

Christoval Texas

76935

2-440

RESPONSE TO LETTER 91

LETTER 92

RESPONSE TO LETTER 92

Mar 29, 1987
P.O. Box 45
Christoval Texas
76935

Mr. William Haigh
BLM Project mgr.
1695 Spruce St.
Riverside, Calif.
92507

Dear Sir:

I am writing about the Draft Supplemental Environmental Impact Statement

I feel that this book is incomplete concerning Tom Green County as I know it.

I am currently ranching and operating a Nursing Home in Christoval. (Concho River Estuarine area.)

92-1 The proposed pipeline will encounter much rock (at least 20 ft deep in most places in the christoval area) This will require much blasting which will endanger local water wells in our area. This rock has already been tested to be this deep on my property where the pipeline is proposed to cross this [illegible]

Yours truly
Harris McWilliams

92-1 Please refer to the response to Comment 6-2 regarding blast design.

LETTER 92

Page II

92-2 Request a thirty day extension of the deadline for written testimony

92-3 also request that the Stacy Dam be designated as a sensitive area on this project.

Harold Pettill

RESPONSE TO LETTER 92

92-2 Your comment concerning an extension of the public comment period is noted.

92-3 The pipeline alignment as analyzed in the Draft SEIS does not cross the site of the Stacy Dam or Reservoir. Please refer to the response to Comment 87-4.

LETTER 93

March 29, 1987
P.O. Box 3
Christoval, Texas 76935

Mr. Hm. Haigh
B.L.M. Project Mgr.
1695 Spruce St.
Riverside, Ca. 92507

Dear Mr. Haigh,

I am writing in regard to the Draft Supplement Environmental Impact Statement. I would like to say that it is incomplete regarding this portion of Tom Green County we know best.

I am a rancher in the Concho River Sensative Area and feel that any blasting in this area would fracture old pipelines and dry holes that would contaminate our water supply.

93-1 Believe me (an old fence builder) when I assure you that you will have to blast to bury anything in this area. You can't bury a fence post three feet deep without a jack hammer.

Please study this situation very carefully before you jeopardize the water supply for an area that is usually begging for drinking water.

93-2 Please consider our request for a 30-day extension of the deadline so that the Stacy Dam project can be designated

93-3 a sensitive area.

Sincerely,

C.L. Mc Millan

RESPONSE TO LETTER 93

93-1 Your comment concerning blasting of the San Angelo area is noted. Please refer to the response to Comment 6-2.

93-2 Your comment concerning an extension of the public comment period is noted.

93-3 The pipeline alignment as analyzed in the Draft SEIS does not cross the site of the Stacy Dam or Reservoir. Please refer to the response to Comment 87-4.

LETTER 94

7700 W. Airport #1301
Houston, Texas 77071
March 25, 1987

William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh

We have enclosed our comments on the Draft Supplemental Environmental Impact Statement for the All American Pipeline proposed extension from McCamey to the Gulf Coast. There is obviously some question for the need of extending this 30 inch line from West Texas. As stated by Robert Walsh of Chevron USA and quoted by Associated Press, "They've taken on a major risk and with the scheme of things in the depressed world market, it's hard to figure out where they're going to get their first oil shipment other than from themselves". He was refering to All American and the fact that they presently have no customers with an oil surplus to be refined elsewhere. This pipeline was conceived when oil prices were averaging $22 a barrel. The supposed glut of California crude has never materialized due to delays in offshore drilling and very unstable oil prices.

94-1 As members of the Lone Star Chapter of the Sierra Club, we endorse the official stand as outlined in a letter sent by Brandt Mannchen, chair of our Water Resources Committee for the Club.

Texas greatest wealth is in its vast lands of immense variety. Much ~~of~~ of it is fertile, lush and abundant with wildlife. We resent the way in which this document has down played the significance of our clean rivers and streams and the scenic natural beauty of our lands. A pipeline of this magnitude would not only degrade the real estate values of lands adjacent to the ROW, but could endanger the many surface and ground water supplies that we depend on so dearly for drinking as well as irrigation and recreation.

This document touched very little on the affects of refining this low grade crude on the already poor air quality in the Houston area. Houston and the surrounding area are presently and have been exceeding the EPA standard for ozone, lead, NOx and sulfur compounds emitted into the air. We feel that in light of present federal legislation regarding air pollution, that Houston would pay dearly for this excessive pollution in fines and increased costs due to compliance with federal standards. Why should we face this burden because California is unwilling to process their own crude!

We also noticed that you did not use data based on Geologist Pete Rose findings on oil spill cleanup. His study has found that operators on average recover between 40 and 50 percent of the oil from spills involving 1000 barrels or more. He concludes by saying " any oil spill of 1000 barrels or more represented a reasonable danger of reaching the water table in the Edwards Plateau area". Therefore, the Edwards Aquifer (confined Balconies zone) is not the only ground water that is very sensitive to contamination from large spills.

We have enclosed a more realistic scenario of an oil spill that occured in East Texas. Your scenario of a spill on Onion Creek does not reflect a worst case condition. A worst case would involve a total rupture of the 30 inch pipeline which would involve a far greater volume of oil being spilled.

RESPONSE TO LETTER 94

94-1 Your comment in support of letter 56 of Mr. Brandt Mannchen is noted. Many of your comments are the same as Mr. Mannchen's' please see Letter 56 for responses to those comments.

The East Texas scenario shows how a spill can have very long term negative effects on fish, wildlife and water quality in general.

Please review our comments and clean up this EIS to reflect a more accurate assessment of the true damages that this pipeline will have on our environment as well as our physical health.

Kevin J. Foto Michelle C. Stright Foto

LETTER 94

Specific Comments on the Draft Environmental Impact Statement for All American Pipeline

1) S-3, document the assertion that, "... the likelihood of groundwater contamination is mall ...".

2) S-3, document the assertion that, "Socioeconomic impacts would be minimal.".

3) S-3, another significant construction impact will be the loss of live oak forests.

4) 1-1, please explain the relationship of Celeron to Goodyear. It is our understanding that Goodyear is trying to sell Celeron.

5) 1-4, Table 1-1, there is no water quality board or water resource commission in Texas. There is a Texas Water Commission and Texas Water Development Board.

6) 1-5, adequate mitigation requires that an authorized officer conduct an environmental and engineering review of the construction and use plan. This must be done and in addition monitoring and enforcement of the construction and use plan needs to be mandatory to ensure all mitigation is done and done correctly.

7) 1-6, we object to this ranking. We refused to rank at the scoping hearing because we did not believe this was an objective and comprehensive way to deal with environmental concerns. Just because more persons rank a certain concern does not mean a lesser ranked concern or one not mentioned at all should be ignored or be little covered. Under NEPA BLM is responsible for investigating all significant environmental impacts. We were led to believe at the League City meeting that the ranking exercise would not be used to throw out concerns but was a way to get an idea of what the public thought the most important environmental concerns were. We feel as if we have been misinformed and resent this type of activity.

8) 1-7, we find it interesting to note that the Minerals Management Service in their Final EIS for Proposed Lease Sales 110 & 112 in the Gulf of Mexico, on page IV-47, indicates that pipelines have a greater inerent risk in spilling oil than tankers do (1.6 versus 0.45-0.90). Please explain how you found a different circumstance.

9) 2-3, Table 2-1, we feel it is not unreasonable to expect that remote control valves should be at every valve location. Why is not this required?

10) 2-5, since the northern alternative has one valve/13 miles (this is misleading since it is not clear if several vavles are at the same location at certain segments of the pipeline) and since 20 miles of the pipleine are insulated after each pumping station to maintain good oil flow what is the maximum and minimum spill size for a 13-20 mile section of pipe? On Table 2-4 only 24 vavle locations are shown (valves every 23 miles).

11) 2-7, why not have automated block valves on the upstream side of major river and stream crossings instead of must manual vavles? Ho long will it take to get to these and turn them off in case of an emergency? This information needs to be shown for each stream crossing or other sensitive area.

12) 2-20, we prefer burying vegetation so that nutrients will be added to the soil rather than burning vegetation which adds to air pollution. In addition a third option is to bundle vegetative material up and use it for wildlife habitat. You should give landowners this option too!

13) 2-22, we are opposed to the use of draglines to install pipe across rivers. We feel that in order to minimize spills that directional drilling should be used to put the pipeline under the riverbed. In addition this method does not cause any water quality problems or disrupt any river bed. Riparian habitat destruction is also minimized.

14) 2-24, we favor the option of allowing native grasses to grow in the ROW. This could be mandated on state lands and be an option on private lands. Quail and smaller animals would benefit from this action and in conjunction with placing vegetative bundles near the corridor could provide much needed and improved wildlife habitat.

15) 2-25, 2.2.2.10, seedlingsshould be planted in all riparian areas.

16) 2-27, 2.2.2.11.1, why is 12 inches enough clearance between pipelines? What happens during an accident?

17) 2-27, 2.2.2.11.2, it is not clear how aquatic damage due to blasting and dredging would be reduced or eliminated.

18) 2-27, 2.2.2.11.2, how will debris be prevented from falling into the river? What measures will be taken to prevent this?

19) 2-29, 2.2.2.11.3, how long will the foam last that is used to seal fractures? ~~Describe the multiple leak detection techniques?~~ What is the cost to clean an aquifer of contamination? If $10 million enough? All reports should be submitted quarterly so that BLM can ensure that no problems are occurring.

20) 2-30, 2.2.2.11.3, why not have the same protection for the Ellenburger Aquifer as you have for the Edwards Aquifer? The hydrostatic testing is something that is already required (see page 2-24) so it is not extra mitigation like this makes it sound.

21) 2-31, 2.2.4, we do not agree that, "All operating facilities ... would be designed for unattended operation and remotely controlled from a main control center ...", since you admit that there will be manual vavles and leaks will have to be stopped by driving to a location to turn off the valve.

22) 2-32, 2.2.4, you need to add addition maintenance centers so that personnel will be no farther than one hour away from any part of the pipeline in case of a spill.

23) 2-33, 2.2.4, please tell which pump stations or block valves during wet weather may not be accessible. They areas need automatic shutoff vavles.

24) 2-33, 2.2.5, whi oil concentration in ppm if left in the water that flushesout the abandoned oil pipeline and gone through an oi-water separator? What is this concentration's effect on aquatic ecosystems? Backfill must be required if pipesalvage occurs and settling of soil happens (lower than the natural contour). How much oil residue is left in the pipeline itself and what is the possiblity of it leaching and contaminating soil and water?

94-2 The land will be permanently devalued and subsidence could occur in the ROW.

25) 2-34, 2.3.1, why not automate valves at 11 stream corssings and all valves period? What is the additional cost of this compared to the total cost of the pipeline? This is especially needed for mitigation over the Concho and Colorado Rivers where Twin Buttes Dam and the Concho Water Snake are threatened.

26) 2-37, 2.3.3, BLM should be able to determine approximate costs for your supposed no project alternative (which should be a separate alternative since it is not a no ac-

94-2 The proposed pipeline would limit use of the ROW to land uses which do not require structures or trees directly over the buried pipe. Mitigation Measures SS-3, G-1, G-2, and S-1 in Appendix A address the measures that will protect the ROW from subsidence.

tion alternative as defined by NEPA) and must according to CEQ regulations as well as the alternatives using tankers, retrofitting refineries, and energy conservation.

27) 2-41, Table 2-11, if All American beats Pactex in building its pipeline what will be the economic costs to that pipeline? This is a cost of the All American Pipeline. The Pactex might bring more jobs, etc. so it might be more desirable than All American.

28) 2-42, Table 2-12, you need to give the maximum spill (worst case) and where it would occur. You need to take into account the 18.8 miles between valve locations (a liberal average) and that the first 20 miles of the pipeline after a pumping and heating station is insulated and makes the oil less viscose and increases the damage potential.

29) 2-42, Table 2-12, please show how the criteria were developed to determine which streams have important fish populations. What are the sensitive soils? Expalin the criteria used and how they were developed. You do not look at the Texas Organisation for Endangered Species lists. You should. Little is known about cave species, where they are, and how rare they are, and how vulnerable they are. You need to discuss this problem thoroughly. How was significance for county taxes decided? We also disagree with the visual, noise, and air quality impacts as we point out later in these comments.

30) 2-45, 2.7.2.1, it says, "most of the reasonable mitigation measures" have been implemented for the Edwards Aquifer crossing for the proposed alternative. Which are you referring to and which mitigation measures have not be accepted and why not?

31) 2-46, 2.7.2.3, what is the largest credible spill for the proposed and all other alternatives. Why is not spill size shown here for comparison purposes? How is credible defined here and how does this scenario compare to the CEQ regulation requirement?

32) 2-46, 2.7.2.4, why would tankers have greater air pollution and oil spill risks? Youneed to show how much of this oil will be shipped out by the ARCO marine terminal and what the possible spills are from this facilities and tankers that use it are.

33) 2-45, 2.7.2.2, you never say how you are going to reduce spill risks for the Twinn Buttes Dam.

34) 3-2, 3.2.2, you seem to downplay that there are 86 miles of shallower groundwater. Please define shallower groundwater and how many people use it. These people need protection too! On page 3-3, Table 3-1, where is the documentation for this table? Where did the information come from?

35) 3-18, Table 3-4, the flow desingations are not entirely accurate here. Although Dickinson, Halls, and Chocolate Bayou may, at some points, be intermittant, they are for most of their lengths perennial.

36) 3-20, Table 3-5, the latest Texas Water Quality Inventory has now come out and should be used to update this information in the FEIS.

37) 3-29, 3.2.4.3, there is a need to do further studies the ensure that the Caverns of Sonora are not effected or contaminated by a spill.

38) 3-30, 3.2.4.4, not all faults are mapped in the Houston area so it cannot be said that the pipeline does not corss any. Additional mapping is needed.

40) 3-32, 3.2.6.1, your definition of valuable for fish is not accurate. It only gives value to species which are fished for recreation or commercial importance and gives no value for those that are ecocystem important. Many smaller food fishes fall into this category. Recreational and commercially fished species relie on these for food.

41) 3-35, 3.2.6.1.5, as far as we are aware there are no native Yellow Perch in Texas.

42) 3-37, Table 3-9, gives no TOES listed species. These should also be looked at.

43) 3-39, 3.2.6.3, to say that no endangered or threatened species are known to occur in streams rossed by the proposed route is a little misleading. We realize the Concho Water Snake is covered later but it is a species that is very aquatic and depends on the Colorado and Concho Rivers for its existence.

44) 3-40, 3.2.7, again you do not refer to the Texas Organization for Endangered Species list.

45) 3-53, Table 3-13, it appears that the pipeline goes very close to several of these plant species (Jone's Selenia and Buckley tridens). It is not clear how these areas will be impacted or protected from impacts.

46) 3-55, the revised TPWD threatened and endangered species list is out now. Please use it in the FEIS.

47) 3-56, if Matagorda Bay could be affected by the pipeline crossing by an oil spill then you must look at species in Matagorda Bay. The Quinn, 1986 reference does not seem to fit into the ext as shown. Please explain. In addition on R-5 of the bibliography it is important to note that EPA has a new Water Quality Criteria book out in 1986 and this should be used in the FEIS.

48) 3-57, Table 3-14, for the Kemp's Ridley Sea Turtle deaths could also occur due to strikes by tankers or boat traffic from the ARCO marine terminal. In addition the marine terminal is a potential source of an oil spill as are the tankers it fills up and these sources of spills must be addressed in the FEIS.

49) 3-62, again contact TOES and look at their list.

50) 3-75, lead is also monitored at air quality monitoring stations.

51) 3-75, part of Harris County is also nonattainment for TSP (see page 3-79) so this statement is not entirely correct.

52) 3-81, 3.2.11.1, research activities that ranchers and farmers are undertaking should be determined now so mitigation can be devised. For instance the Bamberger Ranch raises federally listed Scimitar-Horned Oryx's, is being grown back to native grasses, and is developing a new brand of cattle.

53) 3-93, 3.2.12.3, high unemployment is also due to the agricultural recession.

54) 3-94, Table 3-26, you need to use newer vacancy rates than 1980. More vacancies are likely now due to the recession.

55) 3-96, 3.2.12.6.2, what is the cost of retrofitting refineries to handle 300,000 barrels/day and what is the long-term economic viability of this? This must be a tho-

roughly discussed alternative equally considered with the proposed alternative. You also need to consider a scenario where some oil is refined in California and a lesser amount shipped elsewhere. The demand that you speak of here does not seem to be here to justify this project.

56) 3-99, Table 3-30, California crude is shown to be a very poor quality grade here. After all it has 4.9% sulfur and 718ppm of metals. How will this pollution be treated and removed from the gas stream and how much will and what will be left?

57) 3-100, 3.2.12.6.3, if refining estimates are unknown with and without retrofits why is not a study done to make a determination on this? The fact is that a pipeline may not be needed. It must be pointed out that Houston does not want more SO2 and NOx emissions either, especially since we are nonattainment for ozone which NOx's help create.

58) 3-103, Table 3-33, it is misleading to say All American constructed when .... on 3-104 it says that the pipeline is nearly completed. The pipeline should be listed as under construction.

59) 3-104, 3.2.12.6.4, why should too small a pipeline like All American be built when Pactex would alleviate the need to build a second pipeline? Would not a larger pipeline generate more jobs? You need to contrast the two as alternatives. Maybe more than 300,000 barrels is justified.

60) 3-107, 3.2.12.3, it seems very odd that you do not know how much total oil will be moved by the pipeline. Why is the pipeline just competitive?

61) 3-111, 3.2.14, many Texans would dispute your assertions that the visual impacts are not generally considered to be high or that there is little of high scenic value. The very remoteness of the area will make the pipeline that much more visual and cause degradation of the resource. Your visual attribute ratings are set-up to be biased in favor of spectacular peaks, etc. and against sparely populated area. You need to define common or substantially disturbed and explain the entire visual classification system and how the criteria were developed.

62) 3-112, 3.2.15, it seems you are downplaying the effects of noise on rural or sparsely populated areas.

3-117-119 Table 3-40 Many of the creeks have large subterrainian base flows and are only intermittent ~~occasionally~~ on the surface during excessive dry periods. Most creeks and draws in the east provide drainage to major streams most of the year.

94-3

63) 3-165, 3.3.12.4, you need to use today's housing vacancy figures and not 1980 figures.

64) 3-186, 3.3.14, see our comments above about visual resources.

65) 3-206, Table 3-65, the Elmenforf Onion is only .1 miles south of the pipeline. How willthis area be protected?

66) 4-2, 4.2.1.1, your criteria for system safety and reliability are too vague. What is an unacceptably high risk of significant oil spill? Define. What is not? We disagree with your operating policies, etc. because they presume conformance to regulations or generally accepted industry practices make a pipeline safe. This is not necessarily true as seen by the spills and accidents we have. The location of the accident is very important. This is acknowledged on 4-2. We do not want to accept even a small risk (if it is indeed small).

67) 4-4, 4.2.1.2.1, again we ask why not remote control valves at all locations?

94-3 Thank you for your information on subterranean base flows. The USGS and TWC have also discussed this phenomena with our experts.

LETTER 94

68) 4-4, 4.2.1.2.1, you seem to contradict yourself here. You say that manual valves will be at major rivers and stream crossings and then you say that motor-operated valves on pipeline will be available. Which one is it?

69) 4-5, what is "a sufficient distance drom ... schools, etc. ... to provide no significant risk"? Please define. What distance?

70) 4-5, is the leak detection system the best available? Why are there not sensors at all block valves?

71) 4-7, Table 4-2, you do not show how much oil will be spilled by the time the pipeline is shutoff and the spill response team gets to the site to begin clen-up. This needs to be done.

72) 4-6, it is our contention that the fast detection system to be used over the Edwards Aquifer needs to be in place over all aquifers and stream crossings.

73) 4-8, 4.2.1.2.2, will All American have the pe sonnel watching pipe loading and unloading at the factory and too the pipeline to ensure that pipe is not damaged?

74) 4-8, 4.2.1.3, you are using data here that is from 11-18 years old. Where is recent pipeline data. You need to add the risk of spills from all components of the pipeline to give an overall estimate of spills for the entire system.

75) 4-10, 4.2.1.3.1, we feel it is arbitrary to limit spills to the 50 barrel size since cumulatively small spills can also be dangerous.

76) 4-13, you never give the total number of spills expected and the spill volumes for all the spill information that you are using. You need to use something more comprehensible for the laypersons than rate/mile/year as far as spills go.

77) 4-13, using national spill data is not good enough. The data you use is too old. You need to most up-to-date information and use Texas spill data since this deals with site specific conditions applicable to Texas.

78) 4-13, you talk alot about additional protection for the Edwards Aquifer but this is not your favored route now. Table 4-5 only lists the Edwards Aquifer protection for 6.4 miles of a 500 mile length. Your response times of 72 minutes to close a manual valve is not very assuring especially since your footnote indicates there may be longer travel times. You need to give the minimum and maximum travel times for each segment if a leak occurred and the size spill that would result. After extolling the leak detection system then you say the bigger pipeline offsets all protective measures to reduce spill volumes.

79) 4-15, if remote controlled block valves have the largest influence on reducing the spill size then we say, let's use them along the entire length of th route.

80) 4-16, the assumptions you use for maximum reasonably forseeable spill are not accurate since a two minute pump shutdown seems to quick as do closure of remote control valves. There could be a several hour travel time which means oil would spill be spilling from the pipeline in many cases.

81) 4-19, Table 4-8, it is unacceptable to have a 99.8% chance of a spill in a sensitive aquifer. More protection is also needed for agricultural lands, and endangered species.

RESPONSE TO LETTER 94

LETTER 94

94-4 [4-23 The study on the May 27 '86 Slaughter Creek spill is still inconclusive

94-5 [4-24 "As the river flow increased much of the oil was probably washed from the sediments." is pure conjecture and should be deleted. The oil is always somewhere anyway.

82) 4-20, define a sensitive river crossing. We feel all river crossings need automatic block and check valves.

83) 4-20, what is the percent error for the model and each of the data bases it uses? Was it calibrated using real data? What were the results? How were damage estimates calculated? Do they include the costs to clean-up the environment, monitoring and the cost of restoration?

84) 4-24, 4.2.1.3.3, a study by Harrel (copy enclosed) on the effects of a crude oil spill in a small stream showed effects which lasted for over two years. This seems to contradict your assertion of quick recovery.

85) 4-25, 4.2.1.4, when oil is removed from the pipeline to abondone it how much residual is left? We do not want to have it filled with water (nitrogen gas would be better) since there is the risk of leakage and oil contamination with water.

86) 4-25, the criteria used should not allow the introduction of any pollutants into and aquifer of any amount. You also have to consider damage to cave organisms. The water should be treated until it is clean period. When you say that, "Danger to human health is uncommon ... because concentration of contaminants necessary to cause toxic effects is greater than the threshold of the unpalatable taste and odor of hydrocarbon-contaminated water", you do not take into account chronic illness due to small sublethal doses of toxins like mutagens, teratogens, carcinogens, and nerve poisons.

87) 4-26, shallow water private drinking water wells are not taken into account. These are just as important as public wells because both concern drinking water. Deep aquifers are not necessarily less likely to be contaminate if they have faults and permeable recharge areas. We feel the effects from contamination by hydrostatic testing will not be localized since once an aquifer is contaminate the contaminant plume will continue to spread and move outward.

88) 4-28, 4.2.2.3, just because no groundwater contamination from pipeline spills has been recorded does not mean that such contamination has not occurred. The techniques to find such contamination are now better than they once were and people are only just now starting to look for contamination.

89) 4-36, 4.2.3.2, we feel all river crossings should have directional drilling for the pipeline so that no surface disturbance of the river bed occurs.

90) 4-36, 4.2.3.2, why type of treatment has to be done for hydrostatic testing water? How will metals, bacteriacides, oil and grease, and other pollutants be removed from the water before discharge.

91) 4-37, 4.2.3.3, even if the spill response teams arrive to shut off vavles in three hours it takes longer still to set up equipment and get ahead of the oil. What damage will occur to the riparian vegetation due to spill resonse, how will this damage be mitigated, and what is the full cost of replacing water that cannot be used (the permittee) must pay this full cost?

92) 4-39, the reassurances of how little oil/volume of Lake Travis is not scientific or realistic since it does not respond to the damage done to fish and wildlife in the stream leading into the lake plus it does not take basic physical charactierics of oil into account - oil in lighter than water and floats on top of it and therefore there could be no complete mixing as you suggest and the concentrations will be much greater.

RESPONSE TO LETTER 94

94-4 Please refer to the Modifications and Corrections section for page 4-23 regarding the Shell Pipeline spill update.

94-5 The impacts of oil spills on streams is further described in Comments 6-4 and 22-3.

93) 4-42, 4.2.4, the criteria you use here are subjective and not quantifiable. Please quantify your criteria and tell where your criteria came from.

94) 4-43, 4.2.4.2.1, more detailed information is needed about the Caverns of Sonora. There may be various underground linkages which would lead to the caverns.

95) 4-45, 4.2.4.3.3, groundwater pumping restrictions by HGCSD have reduced subsidence in East Harris County but not in West Harris County where subsidence is increasing. In addition faults are not fully mapped along the pipeline ROW in this area.

96) 4-46, 4.2.5.1, please define what successful rehavilitation is (%cover, what type of species, etc.)? Your criteria are not spelled out.

97) 4-50, 4.2.5.3, Alberta Canada is considerably cooler than Texas. This is not a worst case scenario. You need to have a break in the middle of summer along the insulated portion of the pipeline. How much would the acreage impacted increase in the higher clay content soils.

98) 4-52, how will sedimentation impacts be reduced? We think silt curtains should be required. However the best idea is to directionally drill under rivers so no disturbance occurs.

99) 4-54, 4.2.6.3, Harrel's study showed a greater than two year effect on the benthos (copy enclosed).

100) 4-54, you give nothing on cave species and the impacts a spill would have. Oil spills in coastal marshes can last much longer than three years. The spill in the West Falmouth area in Massachusetts as reported on by Teal and others over the years has demonstrated this.

101) 4-55, Table 4-16, it is important to note that many species have no toxicity data and especially chronic toxicity data is missing.

102) 4-60, again explain what adequate groud cover it. In addition you must utilize criteria that also focus on nongame species and ecosystem values and not simply game species. You criteria for impacting endangered species in not quantitative.

103) 4-61, 4.2.7.2, how will you keep construction crews from harrassing wildlife? How will you mitigate for woodlands destroyed?

104) 4-67, 4.2.7.3.1, it is not clear how you will mitigate endangered species habitats, both state, federal, and TOES listed species.

105) 4-67, you say there is a remote chance that an oil spill will effect San Marcos Salamanders. Please quantify.

106) 4-68, considering how hard it is to find any juvenile turtles, six in five years is quite remarkable. Galveston Bay may be more important than you think. We do not know. You should not assume these turtle finds are not significant. What does remote here mean?

107) 4-73 & 74, 4.2.10, We are not aware of any secondary standards for O3, NO2, or CO. In addition you do not list lead as an air pollutant with a NAAQS. Metals will also be emitted as will toxic organic compounds by the pipeline and the refining of the crude.

108) 4-75, Table 4-20 and 4-21, you need to give the total amount of each pollutant generated during the entire construction period. Otherwise these emission factors mean nothing to the average person.

109) 4-76, how will workers be affected by temporary TSP and CO exceedances? How will these high concentrations be mitigated? You need to show the tons/yr. added by construction.

110) 4-79, 4.2.10.3, the ARCO marine terminal will also generate operational emissions which need to be quantified. You also need to show the emissions generated from start-ups, shut-downs, emergency upsets and their potential effects. It is not just the maximum annual concentration you have to worry about but also upsets which release tremendous amounts of emissions and which occur regularly.

111) 4-84, we disagree that fugitive hydrocarbons from transfer and storage systems are localized. These emissions help form ozone, a regional pollutant, which is usually created at its highest concentration, downwind and away from the sources of hydrocarbons and nitrogen oxides. Again you do not include increased metal emissions from refineries and you do not address a Sierra Club concern identified in the scoping - ozone. This is the largest problem facing us currently in the Houston Area airshed. Yet do not even address it.

You never say how much extra high sulfer crude will be refined in addition to other high sulfer crudes that comes from other countires. Just because high sulfer crudes are already refined here is not an excuse for additional high sulfer oil from All American. What percentage of refinery capcity is used now and what percentage of this is used to refine high sulfer crude and what are the predictions for these two figures in the future? Other pollutants that need to be looked at from refineries are TSP, lead, metals, and VOC's.

112) 4-89, you totally ignore Houston's ozone problem. We are nonattainment for ozone and hydrocarbons and nitrogen oxides form to cuase ozone. We need to reduce emissions and not increase them by 3.0% for NOX's and an unknown amount for hydrocarbons. This is a significant increase in NOx's and sulfer (6.1%) for our area. Where is the mitigation for this? Your assertion that acid rain is not a problem in our area ignores that rains with ph's in the threes have occurred in the Houston area. This section on air quality has been very poorly done.

113) 4-90, how was the 1% and 5% criteria decided? What documentation supports this?

114) 4-93, how was the criteria developed for cocioeconomics (25% change in infrastructure)?

115) 4-103, 4.2.13.2, if the applicant can bore under roairoad tracks then it can srely bore under streams which need for protection. In addition there is no mention of possible road damage when heavy equipment crosses the roads. How will this be mitigated? How will the applicant ensure that the 335 cars are parked in the ROW and not outside adding to environmental damage? What will happen if such offsite parking cannot be guaranteed? What mitigation is required?

116) 4-105, 4.2.14.2, explain what common scenic quality of the site vicinity means. This could be said about any area (doesn't Yosemite have numerous falls and mountains). The low number of viewers does not make a visually unacceptable contrast any more acceptable.

117) 4-106, 4.2.15.1, these criteria should also be used if the noise intrudes into a low noise area because the impacts of extra noise will be more noticeable where the noise baseline is very low.

118) 4-107, there is no real noise mitigation for construction since 70 decibels is the level where noise begins to have physicalimpacts on humans. You need to use mufflers on construction equipment, noise absorbers, and other mitigation to get the levels down to acceptable decibel limits. There is no indication on what mitigation will be done for the two residences within the 65 decibel noise zone.

119) 4-118, it is not clear whether you will avoid coal fields, oil and gas wells, sulfer mines, and gravel pits or not. Please state what you will do. In addition you need to commit to alignment changes to reduce impacts at rivers.

120) 4-125, 4.3.6.1, we do not belive that, "fuel spills would not likely measurably reduce the numbers of important fish species, impacts would be considered insignificant". Using weasel words will not reassure that impacts will not occur and be significant.

121) 4-125, 4.3.7.1, it is not clear what will be done to completely mitigate the loss of 120 acres of riparian vegetation and losses of oak-mesquite-juniper and post oak areas.

122) 4-127, 4.3.7.1.1, so how will you mitigate for the Concho Water Snake? There is no real mitigation given except to say that the alignment could be modified to reduce impacts on the species but you do not say how this will be done. You need to drill under the Colorado River to avoid impacts.

2-452

123) 4-129, 4.3.7.2.1, you give no indication of how you can reduce spill impacts on the Concho Water Snake. A spill could destroy the snake below this area and along with Stacy Dam could cumulatively lead to the snakes extinction.

124) 4-139, again how will the noise levels be mitigated completely for construction and operation?

125) 4-147, 4.4.3.2, how will you reduce the response time to a spill on the Devil's River? What mitigation will you do here?

126) 4-159, 4.4.7.1.1, if plant populations are crossed what will be done to mitigate? We also are concerned about the impacts on the Attwater's Prairie Chicken. The mitigation does not appear to be thoroughly though out. How can the alignment be changed to avoid these birds?

127) 4-166, you should be able to quantify recreational impacts. What are the costs due to this pipeline?

128) 4-172, what will be done about noise form consturction, operation, and abandonment?

129) 4-172, 4.5, you do not give equal indepth consideration to the no action alternative which is not a no action alternative at all. Energy conservation should also be an alternative. Since earlier you claimed you did not have figures for retrofits how can you now claim that they are not liely to be economically feasible. You need a complete economic and environmental analysis to see how feasible they are. You need to show what leakage figures are like for existing Texas pipelines. It seems like you are saying these existing lines are too old and therefore are not very safe. What information do you base this assertion on?

130) 4-174, you say that tankers have a greater risk of oil loss and increased air pollution. Please document this statement. In addition you do not calculate or discuss the impacts on the Pactex Pipeline that building All-American would have. The cumulativ impacts of projects, like Pactex, Stacy, and other pipelines on the Concho Water Snake and other environmental factors have not been considered.

131) 4-174, if mitigation is not spelled out in the Record of Decision then it will be very difficult to force All American to do mitigation. An authorized officer must be designated to ensure complete compliance with the ROD and any agreements or other documents signed.

132) 4-175, 4.7.1, there is a need for remote controlled block and check valves at all valve locations and at all stream corssings.

133) 4-176, Table 4-62, you give no indication here about maximum terrestrial spills and you do not include enough river for possible spill scenarios.

134) 4-180, GW-4, we oppose any groundwater classification system which would write of a source of groundwater as being an acceptable place to pollute.

135) 4-181, G-3, we agree that using trench excavation within two miles of the Caverns of Sonora must be done. G-4, we also agree with rerouting around mineral extraction area. G-5, how long will the polyurethan sealant last in open country? Will it last the life of the pipeline (40 years)? If it will not last 40 years what additional mitigation will be done? Is that two mile either side of the Caverns of Sonora or one mile on either side?

136) 4-182, AB-1, this mitigation measure must also apply to intermittant streams.

137) 4-184, TB-5, you need to show where all the wildlife corridors are and what are the impacts of locating booms near sensitive communities? TB-11, when will surveys for Black-Capped Mireos be done? It must be during the breeding season. TB-12, what other mitigation measures will be used if plant species are located? TB-15, while replanting riparians areas is good there should be a two to one creation since our restoration abilities are not documented to be as good as Nature's. Buying good riparian areas shoul also be an option.

138) 4-192, 4.7.10, you need air quality mitigation as we pointed out in our ealier comments. The ozone problem must not be worsened.

139) 4-193, 4.7.1.3, you have nomitigation for damaged roads. This is needed.

140) 4-193, 4.7.14, VR-1, this needs to be done at all stream crossings. You also need to plant trees nearby.

141) 4-194, 4.7.1.5, your noise mitigation for construction is inaccetable. It puts people at risk. N-1, you need to commit to tree buffering and other noise reduction techniques.

142) 4-194, 4.7.16, O-1, why not plant native grasses, and leave bundles of cut vegetation for wildlife on state lands and offer to do this on private lands. Quail and other species will benefit.

143) Table 4-63, the riparian impact is still significant under construction for terrestrial biology.

144) 4-200, Table 4-63, financial compensation for losses in creation due to spills under land use and recreation needs to be guranteed.

145) 4-201, Table 4-63,.noise construction is unaccepable due to noise levels during abondonement. No mitigation is shown for the supposed no action alternative and no impacts are shown for that alternative. This is against CEQ regulations.

146) 4-212, Table 4-66, there will be irretrievable and irreversible impacts to air, noise, visual resources, etc. as we have enumerated in these comments.

Specific Comments on Appendices

1) A-4, where did the spill statistics come from concerning external corrosion?

2) B-1, what will be the procedure for updating the spill contingency plan? How often will this occur and will there be public input for these revisions?

3) B-3, Figure B2-1, under support delete men and add personnel.

4) B-8, 2.2.5, satisfactorily should be deleted. This is a weasel word.

5) B-51, there is no mention of using microorganisms to clean-up oil spills Why?

6) B-52, there needs to be post monitoring of restoration to determine the success or failure of efforts. If efforts are not successful then additional mitigation is needed.

7) B-57, on all of these maps you need to have equipment locations now. Especially important are the Concho Water Snake and Twin Buttes areas. They are very vulnerable.

8) C-6, it is fallacious to say no deleterious health effects would occur if water was contaminated with hydrocarbons. You are not taking into account the carcinogens, mutagens, and terotogens, and other chronic or sublethal effects.

9) E2-1, you need to discuss TOES listed species.

10) E2-1, here you say there are no special status invertebrates. Yet the US Fish and Wildlife Service have been collecting information about possible candidate species which are cave invertebrates in Travis County. These species and others unknown may exist along the pipeline and a complete flora and fauna investigation needs to be done for the caves and karst features along all proposed routes.

11) E2-2, concerning Ridley turtles there were a great many strandings in 1986. Please check with US Fish & Wildlife about this (Jack Woody in the Albuquerque office). In addition it is inaccurate to infer since young ridleys move to open water that their presence is rare in bays.. We do not know where the young go and it is far too premature to claim they do not need the bays when the bays are the most protected and likely spots that might be used.

12) E2-29, it is never clear how you will mitigate the loss of 314-1510 acres of Golden Cheeked Warbler habitat. Will there be creation or habitat set asides?

13) E3-8, we need to see an oil spill contingency plan that is site specific now.

14) F-2, Table F-1, please check your secondary standards. We believe some of these have been dropped or do not exist.

15) F-4, you state air pollution is minimal but you do not talk about this projects' contribution to ozone air pollution in one of the worst ozone nonattainment areas in the country. In addition you do not discuss toxic hydrocarbon, metal, TSP, and lead contributions from this project.

Specific Comments on the Biological Assessment

We reject the contention by the BLM that the BA is not a part of the EIS process. The BA is used to make certain assumptions, analysis, or assessments in the EIS and therefore is indeed and important appendix and accessory document for the EIS and needs to be commented on. Since the BA is used to justify portions of the EIS it is only fair to allow commenters on the EIS to comment on the BA also.

1) 1-1, here you contradict your appendices, E2-1, when you state that several candidate invertebrates are present in the project area. Please explain and correct the EIS.

2) 1-2, field surveys and results and proposed mitigation should be done now for the EIS to let reviewers comment on what is proposed (full disclosure).

3) 2-1, this is not an additional segment but is part of the original project. You cannot legally under NEPA and CEQ regulations segment a project.

4) 3-1, what information do you have to base saying oil will not kill the root system of wild rice? Hurting the reproduction of wild rice could be extremely serious.

5) 3-4, All American should commit to a transplant program now.

6) 3-5, the population estimate for the Fountain Darter is 12 years old. A newer one is needed.

7) 3-9, the draft oil spill contingency plan is needed now so the public can review and comment on it.

8) 3-13, it is not logical to assume the San Marcos Gambusia has the same acute toxicity concentration level as other Gambusia species. Since it has very specialized habitat requirements it may differe from other species in other ways. In addition there is no chronic toxicity tests that have been done.

9) 3-15, wherever it is thought that All American is going to affect an endangered species' population there should be a commitment to captive breeding and transplanting efforts.

10) 3-24, surveys for species should be done now so the results can be commented on in the FEIS.

11) 3-29, there is no mention of the Texas City marine terminal and how a spill here might affect sea turtles.

12) 3-31, it is the Sierra Club's position that the population of Concho Water Snakes is so threatened at present (Stacy Dam, etc.) that the loss of one individual is critical. How will losses be mitigated? 3-34, the US Fish and Wildlife Service has caved in with a politically inspired biological opinion and is no longer aginst Stacy Dam.

The effect of the pipeline will be greater than what is portrayed since there will be few snakes to repopulate becasue the Stacy Dam will have destroyed and fragmented the population.

13) 3-44, what are the results of the January 1987 nest location and activity survey for bald eagles?

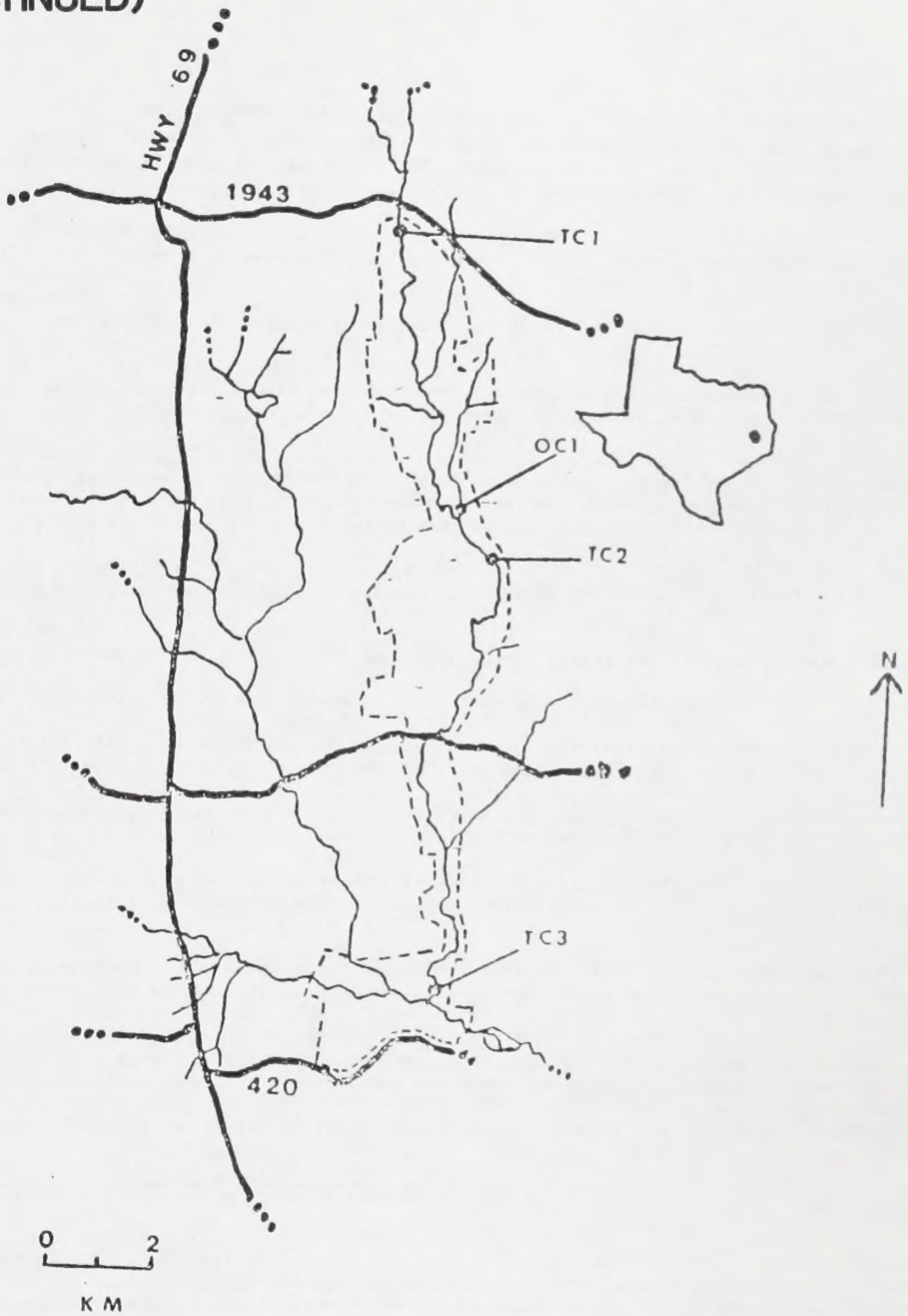
14) 3-58, better mitigation is needed for Attwater's Prairie Cheicken. This species is critically endangered now. Perhaps the ROW can be turned into habitat for this bird. Additional lands should be sought for expansion of the refuge.

Harrel, Richard C. 1984. Effects of a crude oil spill on water quantity and macrobenthos of a southeast Texas stream. Hydrobiology. 124:223-228.

Abstract

On December 6, 1981 an oil spill of 160 barrels (25,440 liters) occurred in a small southeast Texas stream.

Water quality changes, other than the presence of oil, were not evident until six months later when water temperature increased and stream flow ceased. This resulted in decreased dissolved oxygen and increased carbon dioxide concentrations. Responses of the benthic macroinvertebrate community included an increase in density of oligochaetes, decrease in numbers and taxa of chironomids, with eventual complete elimination, and low community diversity (d). Decrease in oil concentration resulted in reversal of these responses. No clean water taxa were collected and complete recovery had not occurred 26 months after the spill when the study was terminated.



Location of Turkey Creek (TC) and Oil Creek (OC) Sampling Stations. Dash Line is Turkey Creek Unit Boundary.

Table 1. Physicochemical Conditions in Turkey Creek and Oil Creek.

STREAM AND DATE	TEMP C	O_2 mg l^{-1}	O_2 % sat	CO_2 mg l^{-1}	AIK mg l^{-1}	pH	S Cond. µS cm^{-1}
Turkey Creek 1979-1980	9-28.5	6.9-11.2	83-103	2-9.5	9-29	5.2-6.5	41-63
Oil Creek							
Dec. 10, 1981	13	8.2	80	7.5	13	6.3	69
Dec. 21, 1981	14	7.8	78	14.5	4	5.8	83
Apr. 3, 1982	19	6.4	81	26.5	4	4.5	82
June 3, 1982	24	0.3	3.6	57.5	5	4.7	155
Nov. 13, 1982	9	2.7	2.4	29.5	17	5.8	68
Apr. 23, 1983	17	6.2	66	18.5	4	4.7	75
Feb. 4, 1984	9	7.6	68	15.1	3	5.3	40

LETTER 94 (CONTINUED)

Table 2. Community Structure of Benthic Macroinvertebrates in Turkey Creek and Oil Creek

STREAM AND DATE	DENSITY NO m^{-2}	NO TAXA	% Tubificidae (% *Limnodrilus*)	% Chironomidae	Diversity $\bar{d}$
Turkey Creek 1979-1980	588-3716	11-44	54-57 (34-51)	12-29*	2.65-3.54*
Oil Creek					
Dec. 21, 1981	1162	13	71 (51)	16	2.69
Apr. 3, 1982	2958	14	81 (75)	4	1.51
June 3, 1982	5188	13	94 (67)	1	1.25
Nov. 13, 1982	8427	4	99 (97)	0	0.17
Apr. 23, 1983	8481	13	93 (88)	1	0.83
Feb. 4, 1984	3046	16	43 (40)	32	2.41

* Chironomidae represented only 1% of the individuals and $\bar{d}$ was 1.84 during April, 1980 at Station TC 1 during extreme flooding and difficulty in sampling.

Longest U.S. oil pipeline short of customers

Ken Post 3-8-87 6E

Value questioned because of collapse in prices, limited offshore production

By RICH CARTIERE
Associated Press

BAKERSFIELD, Calif. — The nation's longest oil pipeline soon will be ready for business, but producers of California's cheap, heavy crude haven't yet signed up to use it.

The $1.2 billion pipeline was built across the Southwest on the premise that an anticipated glut of West Coast heavy crude would be able to compete in East Coast and Midwest markets.

But an expansion of offshore production has been delayed by environmental controversy, and inland producers are wary because of the collapse of oil prices.

"We went from being the pipeline that couldn't make it in time, to the one that made it too early," said Louis J. Resweber, spokesman for Celeron Oil Co., the nation's third largest independent oil company in terms of reserves, with 153 million barrels.

Its 1,225-mile underground All American Pipeline stretches from the Pacific Coast near Santa Barbara to McCamey where it connects with other pipelines, allowing oil to move on to Gulf Coast refineries.

The All American Pipeline is twice the length of the Trans-Alaskan Pipeline. It has a capacity to carry 300,000 barrels a day and is the first oil pipeline from the Pacific Coast to the Gulf Coast.

"This is something people have dreamed about for a century," said Steve Berg-Hansen, an oil industry expert formerly with the California Independent Producers Association.

Berg-Hansen thinks the pipeline will open competition between California petroleum and imported heavy crude from Mexico and Venezuela. It also could compete to a lesser extent with West Texas oil, he says.

But many producers are cautious when discussing the line's value.

They are concerned because of the continuing worldwide oil slump, an unresolved per-barrel shipping tariff, questions about timely delivery and several years' delay in a major expansion of production off California's coast as a result of environmental controversy.

Celeron has been a subsidiary of Goodyear Tire and Rubber Co. since 1983, but Goodyear has been seeking a buyer for the energy operation so it can concentrate on the tire business. The decision was part of a restructuring plan undertaken by Goodyear to fend off a takeover attempt by Sir James Goldsmith, an Anglo-French financier who held 11.5 percent of Goodyear's common stock.

Celeron officials said they intentionally did not seek advance commitments for use of the pipeline, which is contrary to standard industry practice.

"It's just the strangest way I've ever seen to build a pipeline," said Robert Walsh of Chevron USA, adding that his company has no plans to use the pipeline because it does not expect to have a surplus of heavy crude.

"They've taken on a major risk and with the scheme of things in the depressed world oil market, it's hard to figure out where they're going to get their first oil other than from themselves," Walsh added.

California's heavy crude generally sells for $3 to $5 a barrel less than lighter West Texas Intermediate, the U.S. benchmark that currently is selling for $16 to $17. The heavier the crude, the more it must be used for heating and fuel oil and other less profitable petroleum-based products.

Robert Mercer, Goodyear's chief executive, told reporters last year the pipeline needed to carry only 100,000 barrels a day to break even, as long as prices are $15 a barrel or more.

The pipeline was conceived when U.S. oil prices averaged $22.

Using its own oil, Celeron will start filling its pipeline in April. It will be ready to accept shipments from others by summer.

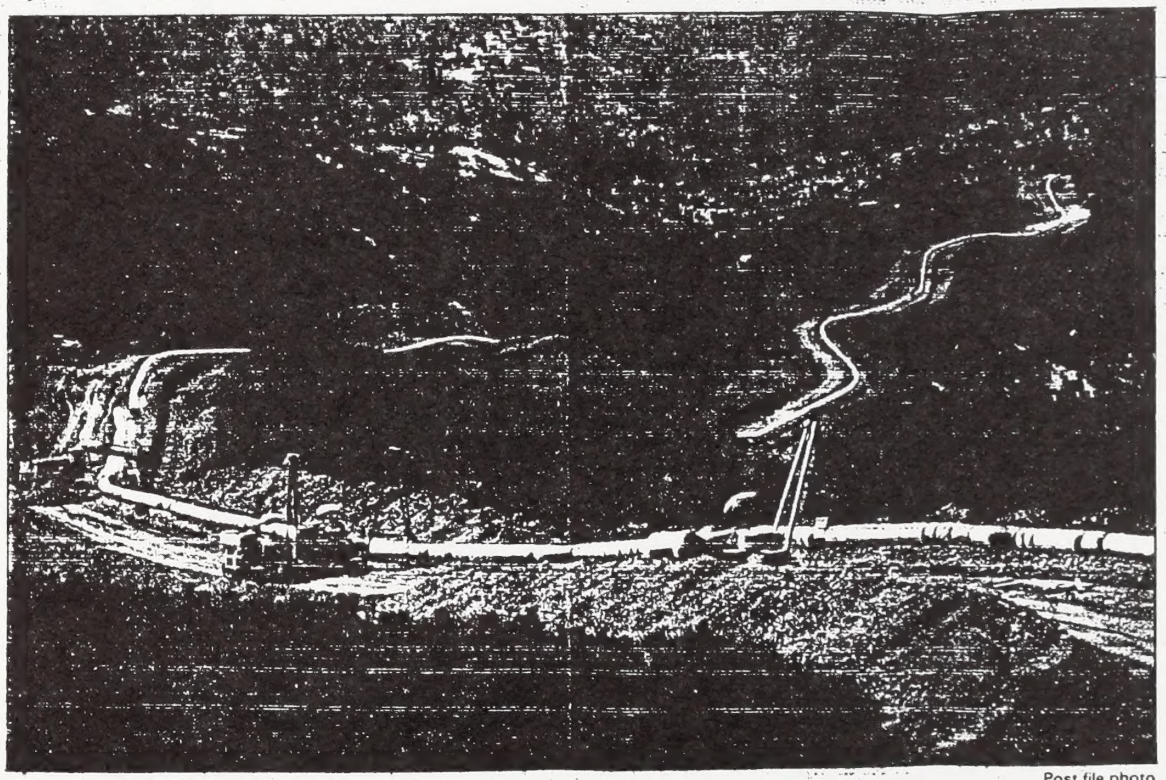
Those first shipments were originally expected from new offshore platforms planned near Santa Barbara. But most of those have been delayed.

Celeron instead is building a feeder-pipe to its 100 million-barrel South Belridge field in Kern County, which it bought from Chevron 17 months ago for $400 million.

Celeron has drilled 399 wells in 13 states the past two years, quadrupling its reserves.

Industry analysts believe Celeron will ask the Federal Energy Regulatory Commission for permission to charge about $3.50 a barrel to carry oil for other companies. That still is expected to keep it cheaper than many other sources, and Celeron has promised a tariff at least $1 a barrel below tanker costs.

"With concerns over timely shipments and costs, everybody's tried to leave the options open to a delivery system that may not work," said Bill Northrop, executive vice president of the 100-member Independent Oil Producers Agency. Tankers can ship for $4 a barrel or less, he said.



Post file photo

The $1.2 billion All American underground pipeline was built across the Southwest on the premise that an anticipated glut of West Coast heavy crude would be able to compete in East Coast and Midwest markets.

2-456

No recovery in oil drilling for California

LOS ANGELES (Reuter) — Drilling for oil in California should continue at last year's sharply reduced levels despite recent oil price gains, analysts said, because much of the oil in California fields is thick, heavy and expensive to extract.

Industry analysts said oil prices would have to increase to near 1985 levels — above $25 a barrel — before any significant recovery is seen in drilling.

"Companies will probably only drill their best prospects," said John Curti, an analyst with Birr, Wilson Securities Inc.

Additionally, few new wells are being drilled.

Only 33 rigs, about a fourth of the number available, were drilling for oil in California fields last week, compared with about 70 last year, said Bill Bolster of Munger Oil Information Services.

"It's in the dregs right now," he said of the state's drilling activity.

While an OPEC agreement to curb oil production boosted prices early this year, they have been below the $18 average target price on speculation that oil-producers might be exceeding their quotas.

Prices for California's marker grade, Line 63 blend, have slumped about 20 percent in the last month to $14 a barrel from a high of about $17.

Current prices are not high enough to justify increased drilling, said Ed Maimgreen of the California Independent Producers Association.

More than half of California's oil comes from stripper wells, which produce less than 10 barrels a day, and it costs between $18 per barrel and $25 to extract that oil. "It's not unusual for a stripper well to cost $18," Maimgreen said.

Many stripper wells along the Southern California coast produce eight times as much water as crude oil. Inland wells frequently require the use of steam injection to spur extraction of the thick, heavy oil, he said.

The lack of current exploratory drilling clouds the outlook for future production in the state, analysts said.

In the heart of California's oil patch, Kern County, which produces about two-thirds of the state's oil, exploratory drilling has slowed to a crawl.

Only 55 exploratory wells were drilled in Kern County last year, compared with 137 in 1985, according to David Mitchell of the state energy commission. So far this year, only five exploratory wells have been drilled.

LETTER 95

RESPONSE TO LETTER 95

ALL AMERICAN PIPELINE COMPANY

A CELERON Company

March 31, 1987

Mr. Bill Haigh
California Desert District
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Bill:

After reviewing the Draft Supplemental E.I.S. during the 60 day public review period, All American submits the attached comments.

All American Pipeline provides its clarification of definition that is consistent with both Federal and industry standards, and a commitment to the environmental concerns of Texas.

We have addressed the areas of concern not only to provide the public with a better understanding of our project, but also to insure that procedures, design definitions and mitigation measures incorporated in the project are consistent with the Settlement Agreement and N.E.P.A. requirements.

Sincerely,

C M Hoffman

C. M. Hoffman

CMH/ccp
Enclosure

M-Corp Plaza, Suite 777
333 Clay Street
Houston, Texas 77002
Telephone (713) 659-2275
Telecopy (713) 659-5049

LETTER 95

1

SECTION 3

COMMENTS ON DRAFT SEIS

95-1a

ORIGINAL: P. 3-63 No sites listed on the National Register of Historic Places occur within the pipeline corridor. Determinations of significance have not been made for the 125 known sites within the corridor, and until evaluations are undertaken, all sites must be regareded as potentially significant.

COMMENT: In accordance with the terms of the PMOA, the methods for obtaining information sufficient to "determine whether or not sites are potentially eligible for inclusion on the National Register of Historic Places" have already been defined. The adequacy of shovel test pits and other survey methods is acceptable methodology despite the assumption in the SEIS that the previous survey work did not produce sufficient information to support an official eligibility evaluation.

The above paragraph from the SEIS should be deleted and substituted with the following:

PROPOSED DEFINITION: "Some of the sites recorded during Texas A&M University's partial survey of the proposed pipeline route were shovel tested. This testing was conducted for the purposes of determining the presence or absence of subsurface remains and to establish horizontal site limits within the ROW. The shovel test pits did not exceed 50 centimeters in depth (Mueller-Wille 1986). Under the terms of the PMOA, the presence of subsurface remains was sufficient to create a presumption that a site was likely to contribute important archeological information in accordance with the National Register's criterion "d" and therefore warranted consideration for further treatment to mitigate any adverse effects of construction."

COMMENT: p. 3-171 Section 3.4 Southern Alternative
Where the comments prepared by All American for Section 4 Environmental Consequences pertain to all 3 routes studied in the SEIS, they are incorporated herein, by reference, for the Southern Alternative and support the BLM decision that mitigation procedures would be marginally effective along this route.

RESPONSE TO LETTER 95

95-1a Your comment is noted. However, the passage in the Draft SEIS does not suggest that work already performed on certain sites along the proposed route is insufficient. The Draft SEIS states that BLM regards such properties to be potentially eligible for inclusion on the National Register of Historic Places until the appropriate determinations are made. In accordance with the PMOA in effect for this project, the procedures necessary to determine significance of properties subject to impact along the selected alternative will be completed prior to pipeline construction. Please review CR-1, it has been modified.

SECTION 4

COMMENTS ON DRAFT SEIS

95-1

ORIGINAL: P. 4-6 Assuming, hypothetically, a 1/16-inch corrosion hole in the pipe, a leak of about 2.5 barrels per hour would result and be detected in 24 hours or less. This would be a very small leak. The system is designed such that most leaks would eventually be detected through the computerized leak detection system, and only minimal dependence on visual detection is required.

PROPOSED DEFINITION: The above figure should read that a small leak would be detected in 72 hours or less. The figure of 24 hours would be true if the break were close to a pressure sensor. Normal detection times should be considered one minute to comprehend pressure surge preparation time.

95-2

ORIGINAL: P. 4-6 The reliability of the communications system is crucial to the leak detection system and the ability to quickly respond to an oil spill event. Most modern pipeline systems incorporate into their design a backup communications system, and this requirement has been included as a mitigation measure for the All American Pipeline (Section 4.7.1).

COMMENT: Present plans do not provide for a completely redundant system. AT&T has proposed to provide some alternate routing where possible and feasible.

PROPOSED DEFINITION: Table 4-2, page 4-7 should be replaced.

95-3

ORIGINAL: P. 4-27 Small leaks pose a more probable threat of impact to groundwater than major spills or ruptures. Leaks in the pipeline have a higher probability of occurrance than a major rupture. A leak as small as a 1/16-inch diameter hole can be detected in less than 24 hours. Smaller. . .

PROPOSED DEFINITION: Small leaks pose a more probable threat of impact to groundwater than major spills or ruptures. Leaks in the pipeline have a higher probability of occurrance than a major rupture. A leak as small as a 1/16-inch diameter hole can be detected in less than a week.

RESPONSE TO LETTER 95

95-1 New information on the leak detection systems is provided in the Revised Table 4-2 in the Modifications and Corrections Section 3.3.

95-2 Backup communications is considered an integral part of the overall safety of the system. However, Mitigation Measure SS-6 has been revised to delete the specific reference to radio and to allow AAPL to select the backup system of their choice (see Appendix A).

95-3 Please refer to the response to Comment 95-1.

LETTER 95

ORIGINAL: P. 4-63 Eighteen species received an impact rating of 3, also significant. Three raptors (Swainson's, zone-tailed, and white-tailed hawks) could nest in habitats crossed by the pipeline. Detailed nest surveys for active raptor nests will probably be required prior to clearing of the ROW. If an active nest is identified near the ROW, construction timing constraints would likely be required.

Thirteen of the other species with a 3 rating are reptiles with low mobility (3 turtles, 1 lizard, and 9 snakes). These species are either federal candidate species or state threatened species (Table 3-14). It is likely that at least several individuals of each species would be killed during P. 4-64 clearing, a significant impact. However, since most of these species are fairly widespread in proper habitat in counties crossed by the pipeline, it is not expected that the loss of a few individuals would result in a long-term reduction of species' populations.

Two birds also recieved a rating of 3, including the black-capped vireo, a federal candidate Category 1 species (sufficient data available for listing as threatened or endangered). This species is very habitat specific, and is known to occur within 1 mile of the Proposed Route. It is not known if proper habitat occurs along the pipeline on the Edwards Plateau. Detailed habitat delineation and breeding surveys would likely be a part of the Section 7 Consultation for this species. If breeding territories occur within the ROW, pipeline realignment may be required. Since this species is so habitat specific, USFWS may require that none 95-4 of its preferred habitat be disturbed during clearing, which may require pipeline realignment even if no birds are found in the ROW.

The golden-cheeked warbler occurs in older Ashe juniper habitats on and near the Edwards Plateau. Although the species is fairly widespread, it is also very habitat specific. The pipeline would cross many miles of this habitat, and reduction of the Ashe juniper habitat would reduce potential of actual nesting areas for this species. Because their habitat is so widespread, and the warbler is known to nest in many counties, no population related impacts are expected. Some field surveys may be required in the highest quality habitat to ensure that no large breeding populations are adversely impacted.

COMMENTS: The statements above seem to ignore the fact that field surveys for these species is on-going. The Final SEIS should point out the fact that the surveys were completed and that construction impacts have been adequately mitigated by the company. Any alignment changes which are negotiated as a result of the threatened and endangered species "clearance surveys" will be made before right-of-way acquisition and construction have begun in order to avoid costly shut-downs in the field, etc.

Private lands/condemnation could impact the construction - alignment required.

The Golden Cheek warbler was not included in Field surveys of threatened & endangered species.

RESPONSE TO LETTER 95

95-4 Your comment regarding ongoing field surveys is noted. The mitigation measures in Appendix A of the Final SEIS have been updated to reflect new information and the Biological Opinion in Appendix C.

ORIGINAL: 4.2.7.3.1 Threatened and Endangered Species
P. 4-66 Plants. An oil spill at the Edwards aquifer (i.e., Onion creek area) could potentially impact the only known population of Texas wild rice (federal and state endangered) known to occur along the upper 4 miles of the San Marcos River confluence with the Blanco River. Although the probability is low, it is possible that oil from a spill would travel approximately 12 miles south via the ground water system to Spring Lake and the San Marcos River. This would result in a signifiant impact to this population. An oil spill at any sensitive plant community adjacent to the pipeline ROW would likely result in a significant impact.

95-5

COMMENT: Due to the distance of wild rice location from the pipeline, the possibility of damage by oil spill becomes so remote that it is an impossibility. The oil would have to percolate down to the water table and horizontal movement for 12 miles to reach this plant site. Worst case scenario supports deletion of this statement.

PROPOSED: AAPL requests deletion of this statement.

ORIGINAL: 4.2.8.3 Operation.
P. 4-71 Indirect impacts to significant cultural resources are most likely to occur during the projected 40-year operating life of the project. Such impacts would tend to occur outside of the 100-ft construction ROW. However, the probability that a given cultural resource would be subject to indirect impact decreases with increased activity associated with facilities operation itself. The principal threats to cultural resources are created by improved access to all sections of the line and concomitant increased exposure of sites to both pipeline company personnel and the general public. Impact under these circumstances may be subtle and very slow to occur, as in repeated surface collecting of artifacts by non-professionals. Nonetheless, they may have the long-term effect of irreversibly compromising sites physical integrity, an thereby diminishing cultural and scientific values.

95-6

COMMENTS: The presence of the pipeline right-of-way will not provide increased exposure to the sites beyond the 100' area of clearing and site disturbance. One must be aware that all fences cut during construction will be replaced to their original (or better) condition. This alone will eliminate any access to the site areas which are beyond the ROW. The pipeline is crossing private lands and any amount of public access which may presently exist on these lands now will not change in the future simply because the land is crossed by the pipeline.

PROPOSED
DEFINITION: DELETE.

RESPONSE TO LETTER 95

95-5 Your comment regarding impacts to Texas wild rice is noted. We agree that the possibility of damage to Texas wild rice by an oil spill is very remote; however, the Draft SEIS includes discussions of all potential impacts including this catastrophic oil scenario.

95-6 The potential for indirect impacts to cultural resources during the lifetime of the pipeline cannot be disregarded. As noted in the SEIS, these impacts may be subtle and slow to occur. Controlled access and repair of boundary fences will substantially reduce those impacts but may not negate them entirely.

LETTER 95

ORIGINAL: P. 4-92

Construction of the pipeline would also create some disturbance of private lands used for deer, waterfowl, and exotic game hunting. Hunting activities and opportunities would not be impacted, but game management, especially of exotic species, would be affected. The counties most likely to be impacted include Kerr which contains 26,000 exotic animals, Kimble, and Gillespie. The Edwards Plateau area contains approximately 80,000 animals, which represents 67 percent of the total surveyed exotic game in the state (Traweek 1985). Because of the high value of the exotic stock, expensive fences are generally constructed to confine the animals. During pipeline construction, these fences would be removed and if adequate measures are not taken to protect the livestock and exotic animals from trenching activities, significant impacts could accur (refer to Wildlife, Section 4.2.7). Negotiations would occur between the private property owners and All American to ensure that fences necessary for exotic game confinement would be built. 95-7

COMMENT:

It should be noted here that 65% of the total 120,000 exotic animals surveryed in Texas are "confined" and the remainder are "free-ranging" (Traweek 1985). Thus, given the large number of "confined" animals, the potential for construction-related impacts are very minimal.

These animals are non-native species and are raised for commercial hunting and/or breeding purposes. They are valued much the same as other livestock and are protected during construction accordingly. For instance, the Bamburger Ranch in Blanco County where pipeline alignment crossed sensitive exotic habitat was realigned to minimize the impact.

2-463

ORIGINAL: P. 4-107

4.2.15.3 Operations. Noise effects from operation of the proposed pipeline would be geographically isolated to the vicinity of the pump/heater stations. Using worst-case terrain assumptions of flat terrain with no barrier effects and no equipment directivity effects, pump station noise emissions were modeled (see Appendix G). The results indicated that Stations 1, 2, 3 and 5 at McCamey, Sonora, Mountain Home, and Sheridan, respectively, are sufficiently distant from all noise sensitive receptors to preclude significant noise impacts, although the station noise may be audible at some receptors depending on background conditions. There are two residences approximately 150 ft. and 450 ft. from Station 4 at Seguin that would probably experience station noise in excess of the 65dBA threshold level over the life of the project. Actual noise impact levels would depend on the placement of the pump station on the site and other site design features. The noise effects from Station 4 would be considered significant. 95-8

RESPONSE TO LETTER 95

95-7 Thank you for commenting on the potential for impacts to exotic animals. Your statements are correct, and significant impacts to exotic animals are not expected.

95-8 Table G-1 in Appendix G was reevaluated subsequent to publication of the Draft SEIS. The noise estimates were based on assumptions about the pump units and heaters that are not believed to be realistic. Consequently, your comment is correct that Table G-1 substantially overstates the noise effects of the pump stations. Please refer to the Modifications and Corrections section for page G-1 for the revised Table G-1. We are unable, however, to verify your noise emission levels at the 3-foot reference distance or to correlate the resulting source to noise level contour distances (presented in tabular form).

With regard to your related comments (95-11 and 95-12), the methods you cite for combining sound levels and estimating divergence attenuation based on distance are accepted standard methods and are incorporated into our modeling efforts. The basic difference, then, is the noise emission level assumed at the source. Notably, within your letter you variously cite emission levels at a 3-foot reference distance of 96 dBA for a single 2,500 horsepower (H.P.) electric motor (page 7) and 85.9 dBA for three 2,500 H.P. electric motors (page 6).

Based on our independently obtained industry sources, the levels you cite appear to be opposing extreme cases (Ranada 1986; Rose 1986; Miceli 1986 and 1987; Christianson 1987). The lower level would be barely attainable with the most extreme application of motor design, construction and noise baffling. The upper level would be a probable worst-case for the application being evaluated in the SEIS. Consequently, we have reevaluated our pump station noise analysis using two separate motor/pump emission level assumptions (90 dBA and 96 dBA per 2,500 H.P. unit) to provide a range of impact distances and an assumed emission level of 90 dBA per 30 million Btu/hour heater. The quantitative results are presented in Table G-1 in the Modifications and Corrections Section 3.3. The effects on significant impacts are minor, dropping one receptor at the Seguin Station from "probable" to "possible" long-term significant noise effects. Refer to the Modifications and Corrections section for page 4-107.

95-8 Cont.

COMMENT: An attempt has been made to correlate with the data contained in Table G-1 contained in Appendix G. The distances shown in Table G-1 grossly exaggerate the pump station noise conditions. Typical station noise levels, while relatively high at points close to the source(s) (or even calculated at the source), are known to attenuate sharply as a function of distance away from the source. Based upon manufacturers data, the following table is provided:

Source		Noise(dBA)	Distance from Source to Contour (Ft)		
Case	Condition Modeled	@ 3 Ft.	70 dBA	60 dBA	50 dBA
1	3-2,500 hp elec.motors	85.9	30	90	230
2	2-30mm BTU/hr.heaters	83.0	19	58	170
3	Case 1 plus Case 2	85.9	30	90	230

PROPOSED DEFINITION: 4.2.15.3 Operations. Noise effects from operation of the proposed pipeline would be geographically isolated to the vicinity of the pump/heater stations. Using worst-case terrain assumptions of flat terrain with no barrier effects and no equipment directivity effects, pump station noise emissions were modeled (see Appendix G). The results indicated that Stations 1, 2, 3 and 5 at McCamey, Sonora, Mountain Home, and Sheridan, respectively, are sufficiently distant from all noise sensitive receptors to preclude significant noise impacts, although the station noise may be audible at some receptors depending on background conditions. There are two residences approximately 150 ft. and 450 ft. from Station 4 at Seguin that would not experience station noise in excess of the 65dBA threshold level over the life of the project. Actual noise impact levels would depend on the placement of the pump station on the site and other site design features. The noise effects from Station 4 would not be considered significant.

95-9

ORIGINAL: P. 4-130 4.3.8.2 Operation. Thirty-six sites are known to exist in the Northern Alternative corridor vicinity but exterior to the actual construction ROW. Significance data for these sites are largely unknown. The number of sites which actually exist within the 1-mile study corridor straddling the line is unknown. The potential for significant and long-term impacts of an indirect nature is quite high however, it cannot be quantified without vastly increasing the cultural resource data base along the entire mile-wide corridor.

COMMENT: The suggested revision here is as for page 4-71. The above Section 4.3.8.2 implies that the pipeline crossed unfenced, public lands. This is not true. The route crosses fenced, private lands. All existing fences will be replaced immediately following construction and, thus, no increased access to these lands will result.

PROPOSED DEFINITION: Delete total item.

95-9 It would be unrealistic for BLM to assume that once a pipeline is installed and buried, no further access would occur. Additionally, access to ancillary facilities for water and electrical distribution and other needs should be considered. Controlled access through reconstruction of fences on private lands will substantially reduce future indirect impacts. As noted in the Draft SEIS, the total number of sites which may be affected by indirect impacts is unknown, but is in excess of thirty-six properties. The potential for indirect impacts must be addressed even where mitigation measures and pipeline construction procedures are designed to reduce or eliminate the problem.

95-10

ORIGINAL: P. 4-131 In summary, the construction and operations air quality impacts for the Northern Alternative are not considered significant, but the additioinal pump/heater station and 60 miles of pipe would result in an increase in total project emissions over the Proposed Route.

COMMENT: Suggest a minor revision of the above paragraph to read as follows:

95-10 Thank you for your comment regarding the Northern and Southern Alternatives. Please refer to the Modifications and Corrections section for pages 4-131 and 4-163.

95-10 Cont.

PROPOSED DEFINITION: "Although the additional pump/heater station and 60 miles of pipe would result in an increase in total project emissions over the Proposed Route, the construction and operations air quality impacts for the Northern Alternative are not considered significant.

ORIGINAL: P. 4-139

4.3.15.2 Operations.
Applying pump/heater station noise emissons modeling results to the station sites for the Northern Alternative indicated that no sensitive receptors have been identified that would be within the 65 dBA noise level contour for Statins 1, 2 and 3. There are existing residences near the proposed sites for Stations 4, 5 and 6 that could be empacted by long-term noise levels in excess of 65 dBA. These would be considered significant noise impacts although actual noise levels at the residences would depend on the final determination of site location, the placement of the pump/heater station on the site, and other site design features such as the existence of terrain barriers on the site.

COMMENT: This conclusion should be reevaluated in view of the exaggerated noise levels contained in Table G-1. See comment to Section 4.2.1.5.3, p. 4-107, fifth paragraph.

We disagree on levels of noise. There is a wide range of difference.

95-11 We submit the following information for your review and consideration.

Overall Sound Level 'A' Scale at 3 Feet

1250 HP	Frame 5810US	91dbA
2500 HP	Frame 6812	96dbA
3000 HP	Frame 6813	95dbA

A rule of thumb covering the effect of distance on overall sound level is that twice the distance from the sound source lowers the level by 6db. As an example, at 3 feet from source the level is 91dbA, 6 feet level 85dbA, 12 feet 79dbA etc. (This information provided by Electrco Quip, Inc., Houston, TX (713/999-1551).

I have enclosed a copy of a page from my APP manual with a formula for establishing db level at X distances.

This same method is used to determine the overall sound level if the individual octave band levels are known. The octave bands, are combined two at a time using the results of previous combination with the next band level. The final answer is the overall level.

RESPONSE TO LETTER 95

95-11 Please refer to the response to Comment 95-8.

EFFECT OF DISTANCE

In a free field where sound from a point source can spread out equally in all directions the sound pressure decreases with distance. Tests have proven that the product of pressure times the distance is a constant. Expressed mathematically

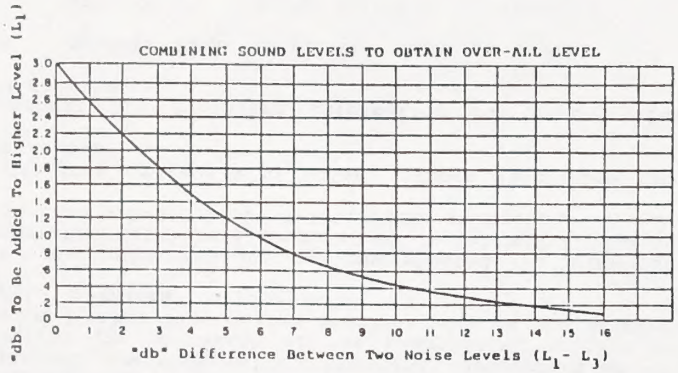
$$P_1 r_1 = P_2 r_2 = k$$

where P_1 is the sound pressure at distance r_1 and P_2 is the sound pressure at distance r_2.

Using this as a basis it can be shown mathematically that

$$SPL2 = SPL1 - 20 \log \frac{r2}{r1}$$

95-11 Cont. If r1 is 3 feet and r2 is 6 feet (or twice the distance) SPL2 will be 6 dB2 less SPL1. In other words, if we double the distance away from the point source we reduce the SPL by 6 db. This is an easy test for determining the existence of a free field. This also points out the necessity for determining the distance from the point sources the data was recorded, or the specified value must be met.



(This information provided by Mfg. Siemens Allis Small Motor Div. (713/999-1551) Houston, TX)

2-466

95-12 ORIGINAL: P. 4-140 There are existing residences near the proposed sites for Stations 4, 5 and 6 that could be impacted by long-term noise levels in excess of 65 dBA. These would be considered significant noise empacts although actual noise levels at the residences would depend on the final determination of site location, the placement of the pump/heater station on the site, and other site design features such as the existence of terrain barriers on the site.

COMMENT: Already included in previous comment.

95-12 Please refer to the response to Comment 95-8.

LETTER 95

ORIGINAL: P. 4-165 4.4.11.1.2 Land Use Regulations and Plans. The pipeline location is consistent with applicable state and county regulations. Final route selection would be negotiated with private land owners. Road crossings would require easements, which would be secured from the County prior to construction, from the affected jurisdiction.

95-13 COMMENT: Reference to county road crossing permits should be deleted as the counties, and county commissioner courts, have no authority to <u>require</u> a county road crossing permit (see comments for page 4-92, Land Use Regulations and Plans).

PROPOSED DEFINITION: Suggest you revise the above Section 4.4.11.1.2 to read as follows:

"The pipeline location is consistent with applicable state and county regulations. Final route selection will be negotiated with private land owners".

ORIGINAL: P. 4-175 <u>Measure SS-2</u>: Installation of remote-control block valve and mechanical check valve to reduce oil spill volumes from pipeline ruptures.

<u>Effectiveness</u>: The remote-control block valves and mechanical check valves will reduce the loss of oil by pipeline draindown from 1 to 4 hours to about 3 minutes.

95-14 <u>Application</u>: Remote-control block valves will be installed at locations of sensitive resources that would be significantly impacted if an uncontrolled spill were to occur. The locations are listed in Table 4-62. The cost to add remote actuation to an existing block valve and check valve is about $25,000; to add remote actuation to an existing block valve and to add a check valve where one is not present is about $53,000; and to add a remote actuated block valve and check valve is about $97,000. The estimated cost of bringing in distribution voltage power (overhead) and communication is about $17,000.

2-467

RESPONSE TO LETTER 95

95-13 Additional research has been done on the issue of whether individual counties have the authority to require county road crossing permits. The Railroad Commission and individual counties indicate that road crossings will require state and county approvals. Historically, because state requirements are similar to county standards, the county has not required a permit.

95-14 The new cost information on converting manual valves to remote operation has been included in the revised Mitigation Measure SS-2 (see Appendix A). The measure has been modified and certain valve locations altered. However, BLM believes the additional remote-control valves identified in revised Table 4-62 are warranted.

95-14 Cont.

COMMENT: The economic impacts of this action are listed below. Note that a conservative estimate of 2½ miles per location has been used for communmications connections.

PROPOSED ROUTE - add remote actuation to 5 valve locations; add 1 remote actuated block and check valve; 15 miles of communmications connections:
Total Cost - $477,000.00

NORTH ROUTE - add remote actuation to 8 valve locations; add 3 remote actuated block and check valves; 28 miles of commucications connections:
Total Cost - $967,000.00

SOUTH ROUTE - add remote actuation to 6 existing valve locations: add 6 remote actuated block and check valves; 30 miles of communications connections:
Total Cost - $1,242,000.00

All American Pipeline cannot concur with BLM's location selections as shown in Table 4-62. Hydraulic study of proposed and alternative routes dictated the valve locations which minimize probable spill size near sensitive resouces. Table 4-62 should be deleted as valve locations have been provided for all routes on Tables 2-4, 2-9, 210. (This table should be deleted.)

The stated $17,000 per mile cost cannot apply for all situations. Obviously, the cost for a particular location is a function of the distance from that locations to existing powerlines and communications, special considerations and other factors. This cost figure should be reviewed with regard to its origin on the basis that something may be missing; i.e., estimated cost per unit length, etc.

PROPOSED DEFINITION: Delete in total as measure is not applicable.

ORIGINAL: P. 4-177

Measure SS-4: Studies of scour depth will be conducted by the Applicant for major watercourses prior to finalizing the design of each crossing. The results of such studies will be used to determine the appropriate concrete weight and depth of burial. The methods used in this study and results will be subject to independent review during the final design review described in Mitigation Measure SS-3.

95-15 COMMENT: This Measure should be revised to read as follows:

Where applicable or required, studies of scour depth will be conducted by the Applicant for major watercourses prior to finalizing the design of the crossing. The results of such studies will be used to determine the appropriate concrete weight and depth of burial. These water crossings are regulated by the Corps of Engineers.

ORIGINAL: P. 4-177

Measure SS-6: A radio backup communications system (or equivalent) will be provided for pipeline operation.

Effectiveness: This measure will provide safeguards against total commuications loss and provide backup methods for closing remote-control valves and shutting down pump/heater stations during an emergency.

Application: This measure applies to the Edwards Aquifer recharge zone.

95-16 COMMENT: While a mobile radio system may be planned for communications among operations personnel, it does not follow that it will directly be used for closing remote control valves and shutting down pump/heater stations during and emergency. By way of a mobile radio system, personnel could be dispatched to sites requiring some form of control execution (manually control valves, pumps, etc.). A radio system to remotely control our entire system would be impractical due to its staggering cost and doubtful reliability. This Measure is simply too general as stated. See comment to Section 4.2.1.2.1, page 4-6, fifth complete paragraph.

PROPOSED DEFINITION: AAPL requests deletion of this statement.

RESPONSE TO LETTER 95

95-15 The scour analyses are to be completed on the streams that are susceptable to scour; these refer to Mitigation Measure SS-4 in Appendix A.

95-16 Please refer to the response to Comment 95-2.

LETTER 95

ORIGINAL: P. 4-188

Measure TB-15: Following implementation of Measure TB-1, impacts to wetlands and riparian areas will be reduced by 50 percent. The remaining unavoidable wetlands or riparian impacts will be compensated by enhancement or replacement of a similar acreage of riparian habitat. For example, if a pipeline stream crossing were to result in the disturbance or loss of 1 acre of riparian habitat, the Applicant would identify and replace or enhance 1 acre of degraded riparian habitat elsewhere on the riparian system. Compensation areas would be located as close to the pipeline disturbance as possible. Replacement or enhancement activities could include replanting or transplanting selected wetland shrubs or tree saplings and providing adequate herbaceous cover for stabilization. Actual riparian acreages to be impacted, and compensated, will be determined by selection of a final route and detailed centerline surveys across these habitats. This measure will serve as conformance to Executive Orders 11988 and 11990.

95-17

Effectiveness: This measure will result in the long-term replacement of all wetland and riparian habitat lost from pipeline construction.

Application: This measure will be applied to wetland and riparian areas along the Proposed Route and all alternatives.

COMMENT: The pipeline route does not cross Federal lands and does not cross any federally designated wetlands. Therefore, Executive Order 11990 is not applicable to this project. Further, the pipeline route does not cross any floodplain as defined in Executive Order 11988, rendering this requirement inapplicable.

The very limited area subject to riparian impact is located on private lands, subject to landowner discretion and not under the jurisdiction of BLM, U.S.F.W or Texas Parks and Wildlife.

RESPONSE TO LETTER 95

95-17 Upon further review of construction requirements, we agree that 50-foot construction ROW restrictions at all riparian crossings would not be feasible. As a result we have developed a new mitigation measure (TB-1) in Appendix A combining the original Mitigation Measures TB-1 and TB-15 of the Draft SEIS. This mitigation measure would still provide the long-term replacement of all wetland and riparian habitat lost from pipeline construction. Under the terms of the court settlement, BLM may specify mitigation measures to be implemented. Therefore, this measure is applicable.

ORIGINAL: 4.7.9 Paleontology
P. 4-192 Measure P-1: Mitigation of adverse impacts on paleontological resources will consist of the following elements:

Pre-construction survey of areas identified on the basis of geological maps and previous investigations as having potential to produce vertebrate remains at or near the surface. Such areas are limited in size and distribution.

On-location monitoring of pipeline construction (ditching, boring) through all geological units ranked as high or medium in paleontological sensitivity.

Removal of all vertebrate fossil remains discovered during surface survey and monitoring, employing appropriate excavation and stabilization techniques.

Analysis, reporting, and adequate curation of all collected vertebrate fossil materials.

95-18 Effectiveness: Implementation of this measure will minimize the adverse effects of pipeline construction on paleontological resources and will result in an increased understanding of the stratigraphy and fossil fauna of the project vicinity.

Application: This measure applies to the Proposed Route and the alternatives.

COMMENT: After a thorough review of federal statutes, All American has located no statutory basis for paleontology mitigation. In fact, the only statutory reference to paleontology is an exclusion from study on federal lands under the Archeological Resources Protection Act, 16 USCS 470(b)(b)(1). Since such matters are not deemed protected on federal land, All American believes it is beyond the scope of NEPA to require an extensive surveying, monitoring, reporting and curation program on private land. This position is further supported by the fact that this type of activity was neither required nor addressed in the EIS. Finally, All American only obtains an easement over private land. An easement is merely a right to use the property of another and confers no possessory interests. Therefore, even if this mitigation measure was required, All American has no right to collect or remove fossil remains. All American's rights are limited to constructing, operating and maintaining the physical pipeline.

ORIGINAL: 4.7.16 Other Available Mitigation Measures
P. 4-194 This section describes measures that are not required but that are availale to private landowners to negotiate with the Applicant in their easements.

95-19 Measure O-1: In addition to the restoration measures presented in the project description, other means of restoring disturbed areas may include double-lifting (topsoil segregation), reseeding (native species where applicable), and fertilization. Topsoil segregation will be especially important in agricultural areas.

Effectiveness: This measure will assist in minimizing potential revegetation and erosion control problems in the disturbed areas.

Application: This measure will be applied to the Proposed Route and the alternatives.

RESPONSE TO LETTER 95

95-18 NEPA requires the consideration of environmental concerns which surface as issues during the environmental review process. The fact that no other statute specifically requires consideration of paleontological resources has no particular bearing on the BLM responsibilities in the NEPA process. Paleontological resources have been identified as an environmental issue for the All American Pipeline in Texas, and must be considered in the SEIS.

BLM is fully cognizant of the rights of private landowners and the possessory interest retained by landowners after the issuance of an easement. Easement acquisition negotiations can and should include access for the purpose of performing all required studies and implementation of required mitigation measures. After analysis, any paleontological specimens collected would be either curated or returned to the landowner upon request. Recovery of paleontological and archaeological materials occurred with few difficulties during the study phase of the All American Pipeline west of McCamey, Texas.

95-19 Thank you for commenting. This mitigation measure has been inserted under Mitigation Measure S-1 in Appendix A of the Final SEIS. This mitigation measure enables the BLM Authorized Officer with input from local SCS revegetation specialists and private landowners to determine when additional restoration means are warranted. Also, please refer to the revised Mitigation Measure TB-1 in Appendix A regarding restoration.

The landowner has primary input; however, if ROW stability is in question, the Authorized Officer will stipulate that a reclamation plan is prepared and implemented.

95-19 Cont. COMMENT: This Measure should be deleted, this is an item which is negotiated between All American and the land owner. Reference to this in the SEIS is totally out of place.

LETTER 96

TEXAS AIR CONTROL BOARD

6330 HWY. 290 EAST
AUSTIN, TEXAS 78723
512/451-5711

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R. HAL MOORMAN
HUBERT OXFORD, III

March 30, 1987

Mr. William S. Haigh
Federal Project Manager
Bureau of Land Management
U. S. Department of the Interior
1695 Spruce Street
Riverside, California 92507

Subject: All American Pipeline Draft Supplemental Environmental Impact Statement

Dear Mr. Haigh:

96-1 We have reviewed the above-cited document. Our records indicate that Texas Air Control Board air-related permits have been issued for some of the pumping stations along the originally proposed central route. However, with All American Pipeline's approval, three permits have been voided pending a decision on the final pipeline route. Similarly, case-by-case reviews for each pump/heater station along other alternative routes would be required.

Thank you for the opportunity to review this document. If we can be of further assistance, please let us know.

Sincerely,

Steve Spaw

Steve Spaw, P.E.
Deputy Executive Director

cc: Mr. Robert Davis, Director, Governor's Office of Budget and Planning, Austin
Dr. William J. Sheffield, Office of the Attorney General, Environmental Protection Division, Austin
Ms. Nancy N. Lynch, Assistant Attorney General, Chief, Environmental Protection Division, Austin
Mrs. Debra J. Barber, Regional Director, Abilene
Mr. Eugene Fulton, Regional Director, Waco
Mr. Charley Sims, Regional Director, Odessa
Mr. Herbert W. Williams, Jr., Regional Director, Houston
Mr. James R. Menke, Regional Director, San Antonio

Celebrating 150 Years of Texas Independence 1836 - 1986

RESPONSE TO LETTER 96

96-1 Thank you for your update of Air Quality permit status for the All American Pipeline.

LETTER 97

March 29, 1987
P. O. Box 877
Kyle, Texas 78640

Re: Draft Supplemental EIS
Appendices - January 1987
All American Pipeline Project

Bureau of Land Management
1695 Spruce St.
Riverside, California 92507

Attn: Mr. William Haigh

Gentlemen:

This letter is to confirm my comments to Lanny Reed at the Public Hearing held in San Marcos, Texas on March 17, 1987.

Please reference Map B4-1 which is Onion Creek Sensitive Area Map.

2-474

97-1 1. The proposed route listed on this map is not the route that has been surveyed by All American.

Entrance to our property is from State Road 2770 just South of Hays Consolidated High School. The surveyed proposed route parallels our entrance and the entire length of our property, then crosses State Road 2770 and goes east into Mountain City Ranch. (Locator Map attached).

97-2 2. I have found no reference in your study to safety of lives of school children at High School and lives of two families that are in 350 feet from proposed route. I do not wish to be a statistic.

97-3 3. Fire Protection Plan - Section 5.0, B-64.
Fire protection services for the pipeline facilities would be provided by the closest local fire department to the fire or emergency. The Fire Departments near our property are all volunteer fire departments. They do not have proper equipment or manpower for oil fires or spills.

97-4 4. Page B-66, Section 5.6
Call the following persons in the order listed until one is reached and the situation is reported. That is questionable as to how long this would take.

97-5 5. Page B-65, Sec. 5.3
In previous hearings All American denied the laying of a fiber optic cable with the pipeline. Are they planning this and what is it for?

RESPONSE TO LETTER 97

97-1 The route in the Draft SEIS is correct based on information supplied by AAPL. The 7.5-minute USGS quadrant maps were used for impact assessment. The maps in the Draft SEIS are too gross to establish the precise ROW location.

97-2 AAPL has stated it will negotiate with landowners regarding pipeline placement in sensitive areas. Please note that a new mitigation measure (SS-9; see Appendix A) has been added regarding the minimum distance of pump stations from occupied buildings. The minimum distance permitted between the pipeline and public buildings is 50 feet according to DOT regulations in 49 CFR Part 195.

97-3 Your comment regarding fire protection and the role of local fire departments is noted. AAPL's Emergency Response Team will be responsible for all oil fires and fires in AAPL's facilities. Local fire departments will be responsible only for control of fires in surrounding properties.

97-4 Your concern is noted. The pipeline superintendents and other key personnel will be on a mobile radio system for notification of emergency situations. One person will be "on-call" at all times during off duty hours.

97-5 AAPL found the use of fiber optic cable not to be feasible for their project. Refer to Mitigation Measure SS-6 in Appendix A of the Final SEIS regarding communications.

97-6 6. I could not find anything in your study in regard to an escrow account set up by Celeron or All American to pay for damages to homes, wells and other personal property incurred during construction and due to leaks.

Please review and I again urge the Bureau of Land Management to visual inspect the proposed route and see the changes made in their survey.

Thank you for considering the above mentioned items.

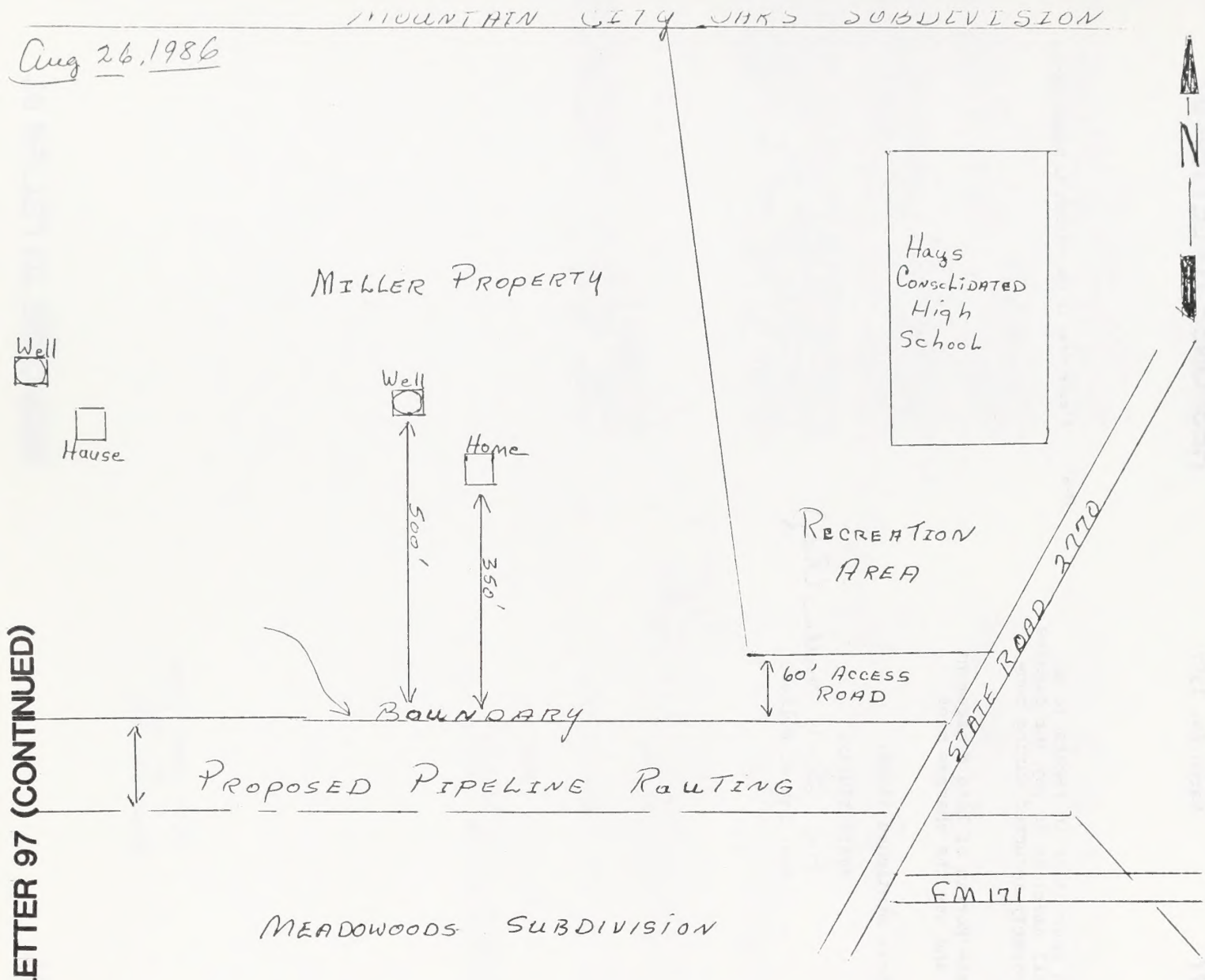
Respectfully,

Mrs. Leo A. Miller (Ruby)

Mrs. Leo A. Miller

/rm
Attachment: Locator May

97-6 Please refer to the response to Comment 18-2.



LETTER 97 (CONTINUED)

LETTER 98

Date: April 1

Memo From: PERRY SMITH

To: Mr. William Haigh

Yesterday you should have received a copy of our comments on the SEIS for the All American Pipeline. In looking over our comment letter later in the day, we saw that we had misused the word "rights of way" in the item "d" on the first page. (We said "right of ways.")

We want to correct that mistake so we are sending you the attached corrected copy. Please substitute it for the letter you received yesterday.

Thanks...

Perry Smith

Save Energy!

EXXON PIPELINE COMPANY

2-477

RESPONSE TO LETTER 98

LETTER 98

EXXON PIPELINE COMPANY
POST OFFICE BOX 2220 • HOUSTON, TEXAS 77252-2220

DARRELL G. WARNER
PRESIDENT

March 31, 1987

Mr. William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

Below are Exxon Pipeline Company comments on the Draft Supplemental Environmental Impact Statement for the proposed All American Pipeline project:

98-1 1. Pages S-4 and 2-46 have references to "Exxon's 24-inch Rancho Pipeline." Exxon has no interest in nor does it operate the Rancho Pipeline. These references should be corrected.

98-2 2. Pages 2-31, 4-6 and 4-7 describe leak-detection capabilities of the proposed pipeline. Our experience and knowledge of the available applicable technology lead us to believe that a leak-detection system with the sensitivities stated in the SEIS is, quite simply, beyond the present capability of the industry for a pipeline system similar in size to the proposed All American. Further, we see little value in listing the sensitivities in the draft or final SEIS and recommend that they be removed in the final SEIS.

98-3 In addition, several other specifications set forth in the SEIS appear to be in excess of reasonable cost effective requirements for prudent construction and operation of typical cross-country pipelines. These include:

a. a back-up radio communication system;

98-4 b. the requirement that pipeline welds be subjected to nondestructive tests to include radiography, magnetic particle inspection, <u>and</u> dye penetrant or ultrasonic tests;

98-5 c. the condemnation of unwilling private property owners in order to perform cultural resource surveys prior to construction;

98-6 d. the use of 50-foot construction rights of way at all riparian crossings;

98-7 e. the removal of all vertebrate fossil remains discovered during paleontology studies, regardless of significance.

While we are not in a position to comment on the merits of these requirements relative to All American, the requirements in "a" through "e" above could be unnecessary and wasteful if applied to other pipelines. The practices should

RESPONSE TO LETTER 98

98-1 Thank you for commenting. It is the Shell Pipeline Company's 24-inch Rancho Pipeline. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172 for a new discussion of the No Project Alternative.

98-2 Please see the updated leak detection sensitivity information in Revised Table 4-2 in Modifications and Corrections Section 3.2.

98-3 Please refer to the response to Comment 95-2.

98-4 Duplicate nondestructive weld tests are not included in the project description. Please refer to the Modifications and Corrections for pages 2-22 and 2-23.

98-5 Hopefully, negotiation will serve to obviate the need for condemnation over as much land as possible. Access to conduct cultural resource surveys and other environmental studies required for the project should be included in the acquisition of the easement. Condemnation procedures, where necessary, will also need to account for the appropriate access for required studies. The Programmatic Memorandum of Agreement for the project, which is binding among all signatory parties, provides for those contingencies where access for cultural resource surveys cannot be acquired.

98-6 Your comment concerning restriction of ROW at riparian crossings is noted. Please refer to the response to Comment 95-18.

98-7 Please note that recovery of paleontological materials will not occur on all portions of the project. As noted on page 4-192 of the Draft SEIS, survey and monitoring will occur only at those locations previously determined to have real potential for significant paleontological resources. Collection and removal of fossil materials at this level is cost-effective in that construction delays are minimized. Materials are removed from the construction zone to be analyzed while construction proceeds. Alternative treatment might require substantial and costly delays while each individual specimen is inspected and evaluated. This is a standard procedure for BLM projects.

LETTER 98

not be viewed as standards for performance for inclusion in future SEIS's, or seen as particularly desirable on all pipelines. There is no indication in the SEIS that this is BLM's intention, but we felt that it was necessary to express these concerns in our comments.

We appreciate the opportunity to comment on the draft supplemental environmental impact statement for the All American Pipeline project.

Very truly yours,

Darrell Warner

RESPONSE TO LETTER 98

LETTER 99

RESPONSE TO LETTER 99

United States Department of the Interior

NATIONAL PARK SERVICE
SOUTHWEST REGION
P.O. Box 728
Santa Fe, New Mexico 87501

IN REPLY REFER TO:

L7619(SWR-PE)

APR 01 1987

Memorandum

To: Federal Project Manager, California Desert District, Bureau of Land Management, Riverside, California

From: Associate Regional Director, Planning and Cultural Resources, Southwest Region

Subject: Review of Bureau of Land Management Draft Supplemental Environmental Impact Statement for the Proposed All American Pipeline Project, McCamey to Webster/Texas City, Texas (DES 87/2)

We have reviewed the subject documents and have the following comments.

2-480

We support the Bureau of Land Management's selection of the Northern Alternative as the preferred route. This would avoid potentially significant impacts of the Proposed Route to Lyndon B. Johnson National Historical Park and to the Edwards Aquifer, as discussed below.

99-1 The Proposed (central) Route could significantly impact Lyndon B. Johnson National Historical Park in that it crosses the Pedernales River several times upstream from the park and crosses many miles of the watershed. The Pedernales River flows through the park and is a primary water source for irrigation of historic ranch lands. Water wells for public and domestic use are also near the river. Crude oil pollution of the river would impact the historical aspects of the park and possibly the public water supply. The statement should thoroughly examine the potential impact of an oil spill on Lyndon B. Johnson National Historical Park and the Pedernales River.

99-2 It should be noted that the Pedernales River, from the confluence with Lake Travis upstream to its headwaters, is included on the Nationwide Rivers Inventory. It is recognized as having significant scenic, recreation, wildlife, and historic values. While pipeline crossings do not necessarily exclude a river segment from inclusion in the National Wild and Scenic Rivers System, such intrusions into the river corridor are discouraged. The river's relationship to Lyndon B. Johnson National Historical Park makes a pipeline crossing especially sensitive.

99-3 An accidental spill along the Proposed Route could also significantly impact San Antonio Missions National Historical Park and other significant sites in the Edwards Aquifer region. The pipeline would cross hundreds of miles of the Edwards Aquifer, both the recharge zone and the surficial expressions of the aquifer itself. This fractured limestone aquifer, one of the most important groundwater

99-1 Thank you for commenting. Your comment regarding the Lyndon B. Johnson National Historical Park and the Pedernales River is noted. Both resources are included in Tables 2-12 and Table 4-32 in the Modifications and Corrections Section 3.2. Pedernales River is listed in Table 4-32 identifying recreation resources affected by an oil spill.

99-2 Your comment regarding the scenic, recreation, wildlife, and historical values of the Pedernales and Colorado Rivers is noted.

99-3 Your comment regarding the San Antonio Missions National Historical Park has been noted. Because the Park is located more than 26 miles from the Southern Alternative, it is not included in Table 3-22. This does not suggest that the Park would not be impacted by an oil spill in the Edwards Aquifer, but the likelihood of an impact occurring is less than for those areas located closer to the pipeline ROW.

LETTER 99

99-3 Cont. sources in Texas, is very vulnerable to contamination. Recharge and movement of groundwater in this aquifer is through interconnecting cracks and caverns in the bedrock rather than through a truly porous media such as sandstone or alluvial fill. The rate of water movement in the aquifer has been measured at as high as one mile per year. Such a high rate of groundwater movement renders the Edwards Aquifer vulnerable to oil spills. It also makes it quite challenging to develop adequate contingency response plans. San Antonio Missions National Historical Park, along with over a million other users, would possibly have their water source contaminated for many years. Impacts to these significant sites in the vicinity of the proposal should be thoroughly analyzed in the statement.

99-4 There are several National Natural Landmarks (NNL) in the vicinity of the Proposed Route which could be impacted by construction or operation of the proposal. The Caverns of Sonora, in Sutton County, are 16 miles southwest of Sonora. There is a real danger of polluting these natural wonders if a spill should occur in the vicinity. The Attwater Prairie Chicken Preserve in Colorado County is 55 miles west of Houston in the Attwater Prairie Chicken National Wildlife Refuge. It is in the immediate vicinity of the Sheridan Pump Station. The Little Blanco River Bluff in Blanco County is 7 miles south of Blanco, and Ezell's Cave, Hays County, is in San Marcos. The statement must consider project related impacts to these nationally significant resources and avoid those impacts if at all possible.

99-5 The Northern Alternative could also potentially impact the Attwater Prairie Chicken Preserve. However, the preserve is further from the Northern Alternative (12 miles) than it is from the Proposed Route (4 miles) (page 3-85, Table 3-22).

99-6 The Northern Alternative would cross a segment of the Colorado River which is on the Nationwide Rivers Inventory. This segment, from the U.S. 283 bridge south of Rockwood upstream to the U.S. 67 bridge at Ballinger, is recognized as having significant scenic, recreation, fish and wildlife, historical and cultural values. While new intrusions on the river corridor are discouraged, a pipeline crossing would not necessarily disqualify this segment from inclusion in the National Wild and Scenic Rivers System and would not impact a national park.

99-7 The Southern Alternative could impact Amistad Recreation Area in that a spill into the Devil's River could reach the reservoir before containment was possible.

99-8 Another area of concern is the potential air quality impacts to numerous National Park Service areas of concern in the airshed caused by refining the 300,000 barrels per day of high sulfur crude oil scheduled to be transported to Texas by the pipeline. The discharge of tens of tons of sulfur per day into the airshed could have serious impacts on natural resources and air quality in many areas up-wind from the Texas coast. Sulfur emissions of this type can create acid depositions many hundreds of miles from the point source. Many areas of National Park Service concern in the airshed could be threatened by such emissions. The statement should review the airflow patterns prevailing landward from the Galveston area and use expected emission products from the refinement of this crude oil to estimate the expected air pollution problems that may result. This is a potentially serious matter that should receive full and thorough evaluation in the statement.

RESPONSE TO LETTER 99

99-4 Please refer to the Modifications and Corrections Section 3.2 for Table 3-22 which lists all the State Parks and Recreation Areas within 20 miles of the Proposed, Northern, and Southern Routes. Table 4-32 identifies rivers and waterways which could potentially be impacted by an oil spill. Polluted waterways and geologic fissures which influence the National Natural Landmarks could indirectly affect these resources detrimentally. Significant impacts could occur at these areas and would adversely affect their recreational value. Based on your comments, Tables 2-12 and 4-32 in Modifications and Corrections Section 3.2 have been changed to identify these resources.

Your comment regarding the Attwater Prairie Chicken Preserve and Attwater Prairie Chicken National Wildlife Refuge is noted. Site-specific studies of Attwater's greater prairie chicken and Houston toad use areas in relation to the Refuge have been conducted. See Mitigation Measures TB-10 in Appendix A for protection to the Attwater's greater prairie chicken. The Houston toad will not be impacted. The preserve will have a site-specific oil spill plan prepared for potential impacts along the Northern Alternative, see Modifications and Corrections Section 3.2 for Table B4-1a.

99-5 Your comment regarding the relative distances of the Attwater Prairie Chicken Preserve from the Proposed Route and Northern Alternative is noted.

99-6 Based on the potential impacts to Amistad Reservoir from an oil spill into the Devil's River, a remote-control block valve is proposed for the Devil's River crossing; please refer to Mitigation Measure SS-2 in Appendix A.

99-7 Please refer to the response to Comment 99-4.

99-8 Thank you for your comment regarding potential acid deposition impacts from the proposed pipeline. In evaluating indirect impacts, lack of specific data about actual pipeline crude refinery destinations and expected refinery emissions changes prevented use of atmospheric dispersion models to accurately estimate the potential contribution to acid deposition by refining the pipeline crude. In addition, use of statistical long-range transport models and trajectory models (modified MESOPUFF II) have a high degree of uncertainty in their results. More accurate models are currently under development that incorporate state-of-the-art atmospheric chemistry and deposition algorithms into the simulations. These models will be available for use in applications such as those suggested by your office. For additional discussion, please see response to Comment 56-122.

LETTER 99

99-9 In conclusion, while all three routes under consideration would have some similar impacts on cultural, natural and recreation resources, the Proposed Route would be the most environmentally damaging as far as impacts to several nationally significant areas and to the Edwards Aquifer. We recommend continued consideration of either a northern or southern route to avoid such impacts.

Many of the concerns detailed in this memorandum were previously submitted to your office in a memorandum dated September 15, 1986.

Eldon G. Reyer

RESPONSE TO LETTER 99

99-9 Your comment regarding support for the Northern Alternative is noted.

LETTER 100

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
DIVISION OF ECOLOGICAL SERVICES
17629 EL CAMINO REAL, SUITE 211
HOUSTON, TEXAS 77058

March 31, 1987

MEMORANDUM

TO: District Manager, California Desert District, Bureau of Land Management, 1695 Spruce Street, Riverside, CA 92507

FROM: Field Supervisor, Fish and Wildlife Service, Ecological Services, Houston, TX 77058

SUBJECT: Review of Draft Supplemental Environmental Impact Statement and Biological Assessment for the All American Pipeline Project, January, 1987.

The U.S. Fish and Wildlife Service (FWS) submits the following review comments on the Draft Supplemental Environmental Impact Statement (DSEIS) and Biological Assessment (BA) for the All American Pipeline project. This review represents comments consolidated from our Corpus Christi, Ft. Worth, and Houston offices.

GENERAL COMMENTS

In general, the subject document is a comprehensive representation of the impacts. However, we do have the following comments. Our primary concern is for determinations of effect on endangered species. Lesser, but significant, concerns include the omission of compensation measures for some habitat damages, the adequacy of the proposed number of remote control valves, and the responsiveness of the spill containment systems.

We have concerns for all the routes regarding endangered or threatened species. Determination of actual impacts will depend on cumulative impacts associated with other projects in the area such as the proposed Stacy Reservoir project for the Concho water snake and the Big Creek project for the bald eagle. We believe a decision as to which of the three routes (if any of them) would be most preferred should not be made until after resolution of potential endangered species issues through the formal Section 7 consultation project. Specific comments on a portion of the Biological Assessment are in a later section of this review.

SPECIFIC COMMENTS ON THE DRAFT SUPPLEMENTAL IMPACT STATEMENT

	Page	Line	Comment
100-1	S5	4	The DSEIS recognizes there is no alternative which is clearly superior. We, therefore, would be remiss if we did not again recommend a more thorough consideration be given

RESPONSE TO LETTER 100

100-1 Your comment regarding support for the No Project Alternative is noted. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172 for an expanded discussion of the No Project Alternative.

LETTER 100

100-1 Cont.

to the no-project alternative. The final environmental statement should provide a cost analysis comparing the pipeline routes, refinery construction, and retrofitted pipelines.

100-2

Page	Line	Comment
2-33	16	The final environmental statement should state who would be responsible for operation and maintenance of the pipeline if additional supplies of crude oil become available, extending the life of the project beyond the anticipated project life (40 years). We recommend that provisions be made for the environmental statement to be updated and revised, should this occur, documenting any changes in operation, maintenance, and potential impacts.

100-3

Page	Table	Comment
3-43 3-135 3-199	3-10 3-44 3-63	The Fish and Wildlife Service is offering these comments to insure that wildlife habitats (wetland and upland) receive full study and scrutiny before selection of a final alternative. A number of impacts could occur as a result of project implementation. The DSEIS repeatedly states that because a linear facility would disturb relatively little land in any one area, impacts of habitat loss or alteration are not considered to be significant. However, figures provided in the DSEIS indicate that the proposed route would impact 5,887 acres of undisturbed habitat, including 138 acres of riparian woodland. Similar impacts would also occur in the southern (6518;260) and northern (6615;121) alternatives. Each of the proposed alignments would also impact 20 to 30 additional acres in the event of an oil spill. The DSEIS proposes mitigation for some of these impacts, primarily by avoidance through remote control valves and the oil spill cleanup plans. Mitigation should also be provided for the unavoidable impacts. This could consist of revegetation of cleared areas, improvement to surrounding habitat, purchase of an appropriate acreage for transfer to a conservation organization for management, etc. These measures should be determined before project approval. We are ready to assist in this process. The State of Texas might also require compensation for any fish kills that may occur as a result of an oil spill. The procedure for providing this monetary compensation should be outlined prior to project implementation.

100-4

Page	Line	Comment
3-147	9	Your ttention is directed to effects on the Attwater's greater prairie-chicken and the Houston toad both located in the Eagle Lake area. Pump station number 6 is adjacent to Church Creek (also Coushatta Creek) which flows through the Attwater's

RESPONSE TO LETTER 100

100-2 It is anticipated that AAPL would operate and maintain the pipeline for its entire service life, however long that may be. Please refer to the responses to Comments 82-1 and 86-10 for further discussion of the 40-year project life. The operation and maintenance of the pipeline would come under the jurisdiction of the TRRC and DOT.

100-3 Your comment regarding revegetation and oil spill mitigation is noted. The mitigation measures detailed in the Final SEIS specify many activities along the lines of those you suggest. The entire ROW will be revegetated with seed mixtures and revegetation schedules determined by the BLM Authorized Officer; see Mitigation Measure S-1 in Appendix A. Habitat compensation for long-term losses to riparian communities would be handled through application of Mitigation Measure TB-1 in Appendix A.

The guidelines concerning monetary compensation for fish kills are referenced and briefly described on page 4-57, paragraph 3, of the Draft SEIS.

100-4 Thank you for commenting. Subsequent to the preparation of the Draft SEIS, site-specific field studies have been conducted for the Attwater's greater prairie chicken and the Houston toad. We agree that these areas and species will require further evaluation and consultation under Section 7 of the Endangered Species Act, and additional measures such as realignment may be warranted. Results of the Attwater's greater prairie chicken survey have identified mitigation in the form of an early morning construction timing constraint near a prairie chicken lek near Sealy and a pipeline realignment and other consideration for a lek near Orchard. See Mitigation Measure TB-10 in Appendix A.

LETTER 100

100-4 Cont.

Prairie Chicken National Wildlife refuge to the San Bernard River. A spill here would contaminate Coushatta Creek, where the Houston toad might exist in ephemeral ponds nearby. Approximately ten miles to the east and again thirty miles to the east, the pipeline is within 200 feet of existing prairie-chicken habitat that would be impacted by construction and operation of the pipeline, as well as by any potential spill. These potential problem areas need further evaluation through Section 7 Consultation process. It may be necessary to realign the pipeline away from these ares.

	Page	Table	Comment
100-5	4-3	4-1	The DSEIS states that All-American Pipeline specifications meet or exceed all of the API Standard 5L requirements. However, Table 4-1 indicates the pipeline specifications would not meet the APL Standard 5L requirement for phosphorus (chemical composition). This inconsistency between the text and the table should be clarified.

	Page	Table	Comment
100-6	4-41	18	The DSEIS states that in the event of an oil spill, much of the oil would dissipate by evaporation, photo-oxidation, and microbial decomposition before the oil could impact a habitat. This seems unrealistic. The percentage that would evaporate in 24 hours (7.8%) is small. We also assume that the amount that would photo-oxidize within 24 hours would be relatively small. It would take several days for microbial activity to digest even a small percentage of the spill. Therefore, we believe the word "much" should be changed to "A small percentage. . ." to more accurately represent existing conditions. Considering the above statements, we believe the potential for impact may have been underestimated and should be reevaluated.
100-7	4-161	9	Note on page 4-161 that sensitive wildlife habitats would not be impacted by a spill because it would be contained before it reaches the bay. Page 4-157 states that marine resources may be potentially affected. How can the marine resources be impacted without impacting the wildlife habitat? Is this a contradiction?

	Page	Line	Comment
100-8	4-174	29	The mitigation measures outlined in Section 4.7 effectively minimize or avoid many of the project related impacts, however, the DSEIS does not adequately address mitigatory measures for

RESPONSE TO LETTER 100

100-5 The phosphorus value in Table 4-1 was incorrect, see Modifications and Corrections section for page 4-3.

100-6 This discussion is of toxic fractions which do have a high evaporation rate.

100-7 We cannot find the statements to which you refer. Text on page 4-161 clearly presents the possibility of an oil spill affecting wildlife habitats.

100-8 Thank you for commenting. Mitigation measures have been revised (see Measures TB-1 through TB-14 in Appendix A). Measure TB-1 discusses compensation for significant unavoidable impacts. A detailed evaluation of compensatory acreage, where applicable, will be developed by the BLM Authorized Officer following selection of the route to be used and preparation of detailed construction plans. Areas will be identified on maps at that time.

LETTER 100

100-8 Cont. the unavoidable impacts. Additionally, in Measure TB-15, each acre impacted should be located on maps in the DSEIS as well as the location of the acre to be used for compensation.

100-9 4-175 18 The majority of the significant impacts associated with the operation of the pipeline involve an accidental spill. Remote control valves would be installed at all sensitive river crossings (Measure SS-2). This measure should be used at additional crossings, reducing the volume of a spill and the extent of the negative environmental impact.

100-10 4-183 24 Mitigation measure TB-1 should include compensation for unavoidable impacts to terrestrial wildlife habitat by replacing or enhancing degraded habitats. Many of the brush and woodland habitats crossed by the pipeline support important game and non-game species, including the golden-cheeked warbler. As such, these habitats should be protected to the greatest extent practicable, including mitigation for habitat degradation. Measure TB-1 should be incorporated into Table 4-63 whenever impacts from construction or operation would result in habitat loss. This would include vegetation removal occurring as part of the clean up procedure for an oil spill.

2-486

	Page	Line	Comment
100-11	A-4	6	Utilization of thicker pipe (greater than 0.281 inches) should also be considered at riverine crossings and other sensitive habitats. Thicker pipe would significantly reduce the probability of a spill because it is more resistant to ruptures and corrosion (page A-4). These measures, as well as the addition of more remote control and motor operated valves, should also be used in sensitive areas such as endangered, threatened, and rare species habitat to reduce the possibility of a spill. Double walled pipe and associated tanks to drain oil from the second pipe might be considered.
100-12	A-6	16	Both page A-3 and A-6 indicate that the pipline would be monitored to minimize the water snd H_2S content in an attempt to reduce failure from internal corrosion. What steps would be taken to reduce excessive levels of water and H_2S when they occur?
100-13	M-1-M30		The maps provided in the DSEIS are of large scale. Therefore, the route of the pipeline is difficult to place. FWS requests current color infrared aerial photography showing the right-of-way easement of the pipeline route for all three routes be provided the FWS for review as soon as possible.

RESPONSE TO LETTER 100

100-9 Please refer to the response to Comment 56-19 regarding application of remote control block valves and Modifications and Corrections section for pages 4-4 and 4-20.

100-10 Your comment regarding this issue is noted. Revised Mitigation Measure TB-1 in Appendix A pertains to compensation for unavoidable significant impacts. This measure is shown on Table 4-63 of the Draft SEIS where those significant impacts are identified.

100-11 Pipe thickness in the All American Pipeline design is 0.500 inches at major river crossings.

100-12 Please refer to the Modifications and Corrections section for page 4-4 for more details on the limitations of water and hydrogen sulfide.

100-13 Color infrared aerial photography was used for impact analysis; however, it was not practical to include these photos as part of the Draft SEIS. USFWS may arrange to review the photography for all three routes through the BLM.

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Page	Line	Comment
B-53		The DSEIS (page 4-32, chapter 4.0) and the Oil Spill Contingency Plan (page B-53, appendices) provide general information on oil spill frequency, prevention, characteristics, and suggested methodologies for spill contaminant and cleanup. Response time is extremely crucial component of the spill response procedure. However, the DSEIS indicates that a site specific cleanup procedure would have to be developed for each spill. We recommend the advance preparation of more detailed plans outlining site specific guidance for spill response and cleanup, particularly in the environmentally sensitive Edwards-Balcones Fault zone. Although additional safety recommendations have been suggested for this area, they are unable to guarantee that a spill would not occur. This area contains many sensitive resources including several federally listed endangered species and a diversity of aquatic organisms that could be assured of better protection from oil spill damages if more detailed clean up plans are available.

100-14

SPECIFIC COMMENTS ON BIOLOGICAL ASSESSMENT

The Biological Assessment (BA) was published pre-maturely. There was not adequate information to support the findings of "is not likely to adversely affect" on five species which include:

Texas wild rice	(*Zizania texana*)
Fountain darter	(*Etheostoma fonticola*)
San Marcos gambusia	(*Gambusia georgei*)
San Marcos salamander	(*Eurycea nana*)
Texas blind salamander	(*Typhlomolge rathbuni*)

Further, the BA indicated there was not adequate information to make determinations on six species to include:

bald eagle	(*Haliaeetus leucocephalus*)
black-capped vireo	(*Vireo atricapillus*)

Both the DSEIS and the BA refer to the black-capped vireo as a candidate (Category 1) species. The black-capped vireo is now proposed for listing and should be referred to as a proposed species.

Attwater's greater prairie-chicken	(*Tympanuchus cupido attwateri*)
Texas snowbells	(*Styrax texana*)
Tobusch fishook cactus	(*Ancistrocactus tobuschii*)
Houston toad	(*Bufo houstonensis*)

RESPONSE TO LETTER 100

100-14 Your comment regarding site-specific contingency plans is noted. The SEIS indicates that site-specific contingency plans must be developed for each sensitive area not for each spill. Please refer to the Modifications and Corrections section for page B-53 and Table B4-1a for a list of the currently proposed areas.

Your comment regarding protection from oil spill damage, utilizing detailed cleanup plans is also noted. Your assumption is correct. However, pending final ROW alignments and requirements for AAPL to complete the Oil Spill Contingency Plan prior to operation, these detailed procedures cannot be submitted for review. Please refer to the response to Comment 18-3 for the procedural timing and review of the Oil Spill Contingency Plan.

New powerlines providing the power for operation of project facilities should incorporate standard raptor protection practices. These powerlines should also be marked to reduce the potential for wire strikes by birds, particularly in black-capped vireo habitat.

The FWS, therefore, in accordance with para. 402.12(f) of the Endangered Species Act requests the Bureau of Land Management to provide for all the above listed species the following:

1. The results of on-site inspections of the area affected by the action to determine if listed or proposed species are present or occur seasonally;

2. A review of existing literature and other information to include county drainage district work and Corps of Engineer permits for affected areas;

3. A complete analysis of the effects of the pipeline construction, operation, and spills including cumulative effects of all other simultaneous projects or actions regardless of their similarity to this project (DSEIS para. 4.6);

4. A complete analysis of alternate actions considered for this proposed pipeline to include (a) building of a refinery in California, and (b) building a refinery in McCamey, Texas;

5. A definitive determination as to "may affect" or "no affect" for each species supported by information for that determination.

The FWS will, at that point, review the information and concur/nonconcur with BLM findings.

We appreciate the opportunity to offer these comments and are ready to assist in the resolution of any issues discussed.

H Dale Hall

MTM:pst

cc:
Field Supervisor, FWS, Ecological Services, Corpus Christi, TX
Field Supervisor, FWS, Ecological Services, Ft. Worth, TX
Regional Director, Region 2, FWS, Albuquerque, NM

LETTER 101

March 30, 1987

Mr. William Haigh, Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

The Texas General Land Office has reviewed the Draft Supplemental Environmental Impact Statement prepared by the Bureau of Land Management (BLM) for the proposed Texas extension of the All American Pipeline, originating at McCamey and terminating at Webster and Texas City.

101-1 The proposed routes cross tidally influenced rivers, creeks, and bayous under General Land Office jurisdiction. The number and locations of these crossings will depend upon the route finally selected, but preliminary indications are that state easements will be required for nine crossings:

West Fork, Chocolate Bayou
Chocolate Bayou
Mustang Bayou
Dickinson Bayou
Hall's Bayou
Clear Creek
Willow Bayou
Basford Bayou
Highland Bayou

The General Land Office is concerned about the detrimental effects that an oil spill from pipeline leakage or failure in any of these areas would have on water quality, natural habitats, and fish and wildlife resources.

101-2 Spilled oil prevents the interchange of oxygen between air and water, adheres to vegetation and wildlife, and becomes suspended below the surface, hindering or prohibiting recovery. While we acknowledge that the Draft SEIS includes detailed methods for spill control, we wish to emphasize that these methods will be minimally effective in forestalling damage to riparian and estuarine environments and associated biota in the event of a spill.

Garry Mauro
Commissioner
General Land Office

Stephen F. Austin Building
1700 North Congress Avenue
Austin, Texas 78701
(512) 463-5256

RESPONSE TO LETTER 101

101-1 Your comment concerning the potential oil spill impacts on tidally influenced rivers, creeks, or bayous is noted. The Draft SEIS described the potential impacts on fishery resources in Chocolate Bayou, Mustang Bayou, Clear Creek, and Highland Bayou and downstream coastal areas on pages 3-36 through 3-39 and page 4-57. No published fishery information is known for Dickinson Bayou, Willow Bayou, and Basford Bayou; however, fish composition is expected to be similar to the water bodies listed above. Fishery resources in Galveston Bay, the downstream coastal area for these bayous, is discussed on page 4-57 of the Draft SEIS.

101-2 Your comment concerning the effectiveness of spill control measures on minimizing oil spill impacts has been reviewed. The impacts of potential oil spills on estuarine environments are discussed on pages 4-54, 4-56, and 4-57 of the Draft SEIS. The intent of the spill control measures is to reduce the area affected by a spill in a timely manner. Significant impacts to aquatic resources could still occur, but the spill control measures should reduce the magnitude of damage. Please refer to the response to Comments 18-3 and 100-14.

LETTER 101

Damage begins immediately, and oil carried by flowing water will cover a large area before a spill response team can set up equipment to begin cleanup operations. The close proximity of this pipeline to the coast increases the likelihood of an oil spill reaching a bay; this possibility is just as great a concern in small creeks and bayous as it is in large rivers. The effects of any spill in a river, creek, or bayou will be far-reaching and cumulative. In coastal waters, preventive measures are of far greater value than corrective measures.

101-3 Block and check valves will be installed along the pipeline to reduce spills if a break occurs. The average distance between these valves, however, is 20 miles; the shortest interval is six miles. Approximately 27,000 barrels of oil could be involved in a spill from a six-mile segment of pipe.

101-4 We strongly recommend the installation of additional automatic check valves near creek and bayou crossings and in wetlands to reduce risk of spills in these exceptionally vulnerable areas. The valves should be routinely tested (at least annually) to ensure that they are operating properly.

The General Land Office would like to review the site-specific spill control measures developed for the project when final plans are approved. In addition, we would like to receive reports on the periodic valve tests after the pipeline is in operation.

The Texas Natural Heritage Program, housed within the General Land Office, has worked closely with ERT to provide information on the status and location of a number of rare plants, animals, and natural communities in the Texas counties that would be crossed by the proposed pipeline. The program submitted comments on the preliminary DEIS to the BLM, and many of the concerns expressed at that time have been addressed.

101-5 After review of the three route options, the Heritage Program supports the BLM's preliminary finding that the north route is the most environmentally sound; however, there are major concerns associated with this route. Of particular concern is that several Little bluestem-Indiangrass prairie remnants are within the pipeline route, at least one of them being crossed directly. Other occurrences of rare plants, animals, and natural communities in or near the pipeline route, noted in previous comments, are of concern to the program. The Heritage Program would like to offer assistance to the BLM in fine tuning the route to circumvent these vital natural resources.

We appreciate the opportunity to comment on the Draft SEIS, to voice our conviction that special precautionary measures should be taken in both construction and maintenance of pipeline segments crossing waterways within the coastal area, and to request continued coordination with the General Land Office and Texas Natural Heritage Program to prevent unnecessary environmental damage.

Sincerely,

Garry Mauro

Garry Mauro
Texas Land Commissioner

GM/TLB/mw

RESPONSE TO LETTER 101

101-3 Thank you for commenting.

101-4 Please refer to Mitigation Measure SS-2 regarding placement of remote-control block valves (see Appendix A). DOT regulations 49 CFR Part 195 require inspection of valves every six months.

101-5 Your comments and concerns associated with the Northern Alternative are noted. Please refer to the revised Mitigation Measures TB-1 and TB-12 in Appendix A.

LETTER 102

M.S. HUCKLE
1823 PARHAVEN DR.
SAN ANTONIO, TX 78232

RECEIVED
DUPLICATE
1987 APR -2 PM 12:30
DISTRICT

March 30-87

C/O WM. HAIGH, FED. PROJECT MGR.
BUREAU OF LAND MANAGEMENT.
1695 SPRUCE ST.
RIVERSIDE, CA. 92507

Dear Sir,

Please inform the Bureau of Land Management for my uncle, EMMETT M. BURCHETT, and myself that as land-owners in BLANCO CO., TEXAS where "ALL AMERICAN PIPELINE CO." has already SURVEYED and staked out its proposed pipe-line that, as previous to this time, my uncle and I still object to the pipeline coming through our property for many valid reasons but largely environmental issues.

Mr. Burchett and I attended several meetings before 1987 on the proposed pipeline and we sent in our letters in 1986 to you for B.L.M. stating our objections and pointing out all the environmental dangers if All American comes across our property in Blanco County Texas. All these dangers are still present, as well

RESPONSE TO LETTER 102

LETTER 102

2,

M.S. HUCKLE
1823 PARHAVEN DR.
SAN ANTONIO, TX 78232

102-1 limiting the present ranch usage of our small place for my uncle's use, who has lived there almost all his life and worked as his parents before him to protect the environment as much as its potential for livelihood and the

102-2 pipeline coming across our small place would definitely DE-VALUE it, as its use would be cut by the pipeline right of way and the animal, plant, scenic and waterway would be so effected (regardless of any outside assessment to these factors).

2-492

We are of that land and know our land and know that the All American or any disruptive project of that nature does NOT belong on it proposing dangers for us or future generations.

Today we will mostly concentrate on the danger All American Pipeline would

102-3 propose to our one and only major water source, MIDDLE CREEK. The line crosses the creek at a dangerous point, which could bring down a high bluff, block the creek and change its route to cut across our big field and wash away much

RESPONSE TO LETTER 102

102-1 Your comment regarding limitation of the present ranch usage has been noted. The permanent pipeline ROW is 50 ft. ROW restrictions do not exclude most ranchland uses including rangeland and agricultural uses, therefore, productivity would not be significantly affected. The restrictions that do apply to the ROW include construction of permanent buildings and tree plantings. Therefore, if the ROW on your land is intended for use as building or tree sites, its value may be limited. These restrictions should not interfere with the current uses of the ranchland and, therefore, would not affect current property values. During construction, the landowner will be compensated for any economic losses incurred. Only short-term visual and land use impacts will occur during construction.

102-3 Each water and bluff crossing will be assessed by the BLM Authorized Officer in the field. Please refer to Mitigation Measures G-1 and G-2 in Appendix A, if Middle Creek is determined to be a geologic hazard. As shown on the maps, Middle Creek is crossed when there is no bluff.

102-2 Please see the response to Comment 102-1.

3.

102-3 Cont.

of the field, soil and cause damage all the way downstream of the creek for us and our neighbors also forever. Should this dangerous event come about, even our buildings (CAMETTA ANTIS LIFE) and under home and his life, the stock and our only one well for household use be ruined. These things all effect the environment and its future in one way or another, so please consider and do REROUTE that all American Pipeline off our Blanco Co. property and to some arid spot where it could do less harm.

Thank you,
M. S. Huckle

M.S. HUCKLE
1823 PARHAVEN DR.
SAN ANTONIO, TX 78232

I agree with the above letter statements on E.I.S. and the land we being cut and de-valued.

Respectfully —
Emmett M. Burchett

LETTER 103

United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VA. 22092

In Reply Refer To:
WGS-Mail Stop 423
DES 87-2

MAR 31 1987

Memorandum

To: Federal Project Manager, Bureau of Land Management, Riverside, California

From: Assistant Director for Engineering Geology

Subject: Draft supplemental statement for the proposed All American Pipeline, California to Texas

We have reviewed the statement as requested by the Bureau of Land Management in the cover sheet included in the document received on January 27.

2-494

103-1 The average annual flow through 1984 water year for Colorado River at Wharton, Texas is 2,646 cubic feet per second (Table 3-60). Tables 3-22, 3-41 and 3-60 which summarize U.S. Geological Survey (USGS) flow records contain a column "Maximum Recorded Flow" which actually contain the maximum annual peak for the period of continuous record. For example, the Colorado River at Wharton contains the value of 100,000 cfs, but the USGS measured 145,000 cfs on July 30, 1938, and the U.S. Weather Service records give a maximum flow of 159,000 cfs on June 20, 1935. Table 3-60 contains a maximum of 189,000 cfs for Nueces River below Uvalde where the maximum known flood is 616,000 cfs. The maximum recorded flow should give the greatest known peak discharge. Therefore, the maximum recorded flow for the Colorado River at Wharton should be revised to 159,000 cfs and for Nueces River below Uvalde 616,000 cfs. Many of the periods of observed record are short, some less than 5 years, and if the maximum is intended to give an expected range of flows this could result in misinterpretation. Tables giving the maximum recorded flow should indicate the period of record.

103-2 The pipe at all stream crossings is to be buried to a depth of 4 feet below the scour depth of the 100-year flood. A more conservative approach would be to design the depth for 4 feet below the scour of the maximum observed flow or the 100-year flood, whichever is greater.

103-3 The statement should indicate the location of the pumping stations relative to the distance from the nearest stream and discuss measures to prevent contamination of surface waters during the operation and maintenance of the pumping stations.

Clement F. Skeen

for James F. Devine

RESPONSE TO LETTER 103

103-1 The summary tables of USGS flow records have been revised. Please refer to Tables 3-6, 3-41, and 3-60 in the Modifications and Corrections Section 3.2.

103-2 The design for stream crossings meets the criteria imposed by DOT regulation 49 CFR Part 195.

103-3 Proposed pump station locations are not located near surface waters. Operational oil spills at these stations will not adversely impact surface waters.

LETTER 104

Critique of the
Draft Supplemental
Environmental Impact Statement
for the All American Pipeline

Prepared for:

Mr. James Collins
Office of the County Attorney
Travis County, State of Texas
County Courthouse, PO Box 1748
Austin, TX 78767

Prepared by:

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Technology Management Group, Inc.
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TMG/R/87-3/2
March 1987

LETTER 104

INTRODUCTION

This critique was prepared in response to a Draft Supplemental Environmental Impact Statement (DSEIS) written by the environmental firm ERT. The DSEIS concerns the All American Pipeline Project which is proposed to cross Texas by 1 of 3 routes. The critiques in this report will focus upon weaknesses, deficiencies, and inadequacies found in the background, or underlying research which support the comments, analyses, or conclusions reached in the DSEIS.

To the greatest extent possible, these critiques will be related to those issues raised by the Travis County Attorney's Office and published in a report to the Mineral Management Service after the scoping sessions in the summer of 1986 (EHA 1986). Throughout this review, the focus will be on surface water since it is a limited resource for the most productive habitats which are associated with the proposed pipeline route. Large numbers of commercially valuable, recreational, aesthetically pleasing, threatened and endangered species are dependent upon the surface water along the proposed route; numerous important habitats are dependent upon this water as well, including riparian vegetation and salt-marsh environments.

Throughout this review the focus will be based upon personal experience (at over two hundred oil spills), project experience with the Alaskan, cross-Panama, and Northern Tier pipelines, and a research library updated with the latest published reports concerning 2 types of damages. The first is pipeline construction; building the pipeline will involve a one hundred foot construction right of way, including trenching through riparian vegetation over a 6 week construction period. This will result in siltation and other disturbances at each major river crossing. Each river crossing will involve fifty workers for a 6 week construction period.

The second type of potential damage will result from oil spills from the operating pipeline. The worst case scenario in the DSEIS involves the spillage of 8552 barrels (359,184 gallons) of crude oil; the worst case scenario involves the contamination of sixty miles of a small river leading to a downstream reservoir. It will be argued that this spill, as damaging as it sounds is probably too conservative a worst case scenario considering the actual operating history of petroleum pipelines carrying this quantity of crude oil.

MATERIALS AND METHODS

The emphasis of this review and critique was to examine those natural resources associated with surface waters along each pipeline corridor; special emphasis was given to the proposed route. Materials from the DSEIS and scoping sessions were reviewed in detail. Much of the relevant primary data and literature supporting these documents was ordered and reviewed as well. A research library was assembled for the project which provided case documentation on the effects of oil spills on freshwater resources like those occurring along the proposed pipeline route (a cross section of this library appears in the Literature Cited section).

The 7.5 minute topographic maps along the proposed pipeline route were purchased and used as base maps for reviewing the DSEIS and for subsequent field work. The approximate axis of the proposed pipeline was transferred from the DSEIS to these maps to allow analysis of environmental conflicts. These were compared to the text and illustrations in the DSEIS. Once all relevant information from the scoping sessions and the DSEIS was transferred to the detailed topographic maps, an analysis of sensitive areas was begun.

This sensitivity analysis was based upon past personal experience with several large pipeline projects and oil spills, as well as concepts developed in an earlier work on trends in river spill effects (Baca, Getter, and Lindstedt-Siva 1985). In general terms, the effects of oil on the riverine environment may be classified into two types: running and standing water effects. Running water effects are of a short-term nature (Figure 1), while standing water effects may be more long term in nature, often extending past 2 and upwards of 5 years in duration (Figures 2, 3, 4).

This sensitivity analysis involved the identification of specific areas along the pipeline which appear to be susceptible to the greatest and longest lasting damages from oil spills. Factors which were considered included: a) types of habitat which would suffer long residence time of oil; b) environments subject to interior oiling and pooling of oil; c) plants and animals which, if oiled would be potentially damaged and which have longer recovery rates; d) areas which have more difficult access and are therefore harder to protect and clean up; e) areas which would require more disruptive cleanup techniques to be used; and f) habitats which have high value for associated natural resources.

From this sensitive area analysis, several candidate stations were selected for subsequent field studies. Field trips were then made to major river crossings and to downstream riparian vegetation and salt-marsh environments associated with the proposed route. In January and March 1987, field observations observations were made and site photographs were taken at each of thirty five stations along and downstream from the proposed route (Figure 5).

An effort was made to study pipelines shown on the maps as crossing similar environments; several pipelines under construction or newly completed were studied. This helped to develop an accurate and realistic understanding of the actual environmental damages which were likely to result from pipeline construction (Figure 6).

LETTER 104

GENERAL CRITIQUE OF THE DSEIS (ISSUES 1-12)

Twelve general environmental issues were identified which were judged to be inadequately addressed by the DSEIS. Most of these were discussed in the earliest scoping sessions which were meant to guide the Final Supplemental EIS in its coverage, but which were missing from the DSEIS; they must be addressed in the Final Supplemental EIS for the document to be considered adequate with regard to those natural resources relying upon surface waters.

1. There is still inadequate graphic presentation of the spawning areas and the seasonality of aquatic species; in addition, what data is present is inadequately analyzed, and few conclusions are made from it.

104-1 In EHA (1986) it was stated that, "The potential impacts on rare, endemic, threatened, and endangered species should be evaluated for each alternative." Spawning areas and seasonality of endangered fishes is information which is published and/or available from experts in government and academia. It should be better utilized and expressed. For example Lee et al.(1980) give dates of spawning of the fishes in the study area. Some of this information is summarized in the Appendices of the DSEIS, but nowhere is it presented graphically. Without graphic summaries of available data on spawning sites and seasonality, the evaluation of impact by the pipeline on aquatic species is greatly impaired. The tables on the life history of important aquatic species could be graphically displayed to illustrate details on fish spawning in Texas rivers and lakes in the spring and early summer. This information would be very useful in planning and in evaluating windows around construction periods on specific sensitive rivers under which pipelines are proposed to pass.

2. The worst case oil spill scenario is inadequate for a number of reasons.

104-2 According to the analysis by Rose (1986), based upon historical pipeline performance, about half of the spills from the All American Pipeline along the proposed route will be greater than 2,000 barrels (1 barrel equals 42 gallons); in fact he estimates that the average spill size will be about 6,000 barrels and that larger spills between 20,000 and 75,000 barrels may or could occur. Compared with the estimate of Rose (1986) the DSEIS worst case scenario of 8,552 barrels is conservative. In the scoping process EHA (1986) requested information concerning the, "low probability/catastrophic analytical case". A search of the literature indicates that there is an abundance of real case studies in the published literature which could be used to build a

RESPONSE TO LETTER 104

104-1 The use of graphical presentations to summarize life history events of important fish species is merely an additional tool that can be used in the impact analysis. It does not represent an inadequacy, since this information is provided in Appendix E, Tables E1-2 and E1-3 in the Draft SEIS.

104-2 The commenter apparently misunderstands the intent of the spill scenario given in Appendix C of the Draft SEIS. This scenario is intended to describe the effects of a catastrophic oil spill in the groundwater recharge zone of the Edwards Aquifer. It was not intended to be used to describe effects of a spill into surface waters. The catastrophic spill volumes for certain surface waters are given in Tables 4-9, 4-39, and 4-51 in the Draft SEIS. Some of these volumes approach the 75,000 barrels size mentioned by the comment. The effects of such surface water spills are described in the various technical sections of the SEIS. Please refer to response to Comments 6-4 and 22-3.

LETTER 104

104-2 Cont. worst case scenario for surface water impacts from the All American pipeline (Alexander et al. 1978; Baca et al. 1983; Bugbee and Walter 1973; Burk 1977; Bury 1972; Dahlin et al. 1984; Forrest et al. 1985; Fleming 1981; Hoehn et al. 1974; Kemerel et al. 1985; Masnik et al. 1976; Palm et al. 1979; Pimentell 1985; and Smith 1973).

104-3 Only one example for surface water spill impacts was given in the DSEIS, and its treatment was marginal at best. Problems with the treatment of the case study in the DSEIS include: a) Onion Creek is not very representative of the rivers along the proposed route; b) other cases in different settings involving the same (or more) oil have had effects which are much worse; c) most Texas rivers do not have controllable water flow like Onion Creek; d) there are more endangered and threatened species in the freshwaters of Texas than in many other state waters; and e) no dead fish reported doesn't mean that no fish died. The worst case scenario should consider a more representative river, more oil, and an examination of the natural resources likely to be damaged. For example consider a 10,000 barrel spill at the proposed route river crossing over Chocolate Bayou.

3. <u>There is inadequate discussion of the environmental consequences of small operational discharges which are planned.</u>

104-4 The discharge water to be used in hydrostatic testing will release toxic metals, petroleum hydrocarbons, and bacteriocides into the rivers and other surface waters along the proposed route. The Final Supplemental EIS needs to be more specific as to the limits of each toxic or foreign substance to be used in this process. Ideally the water used in such testing would be treated for removal of such substances, and then returned to the river. The DSEIS does not provide this information; nor does it address the issue of disposal of the waste effluents from this process. Will the effluent be disposed of in the rivers? Small, but sensitive rivers such as the Llano and Pedernales may require only small amounts of these discharges to cause significant damages to natural resources; larger rivers such as the Colorado may have a resilience to these effluents. It is a critical question which cannot be evaluated from data provided in the DSEIS. Addressing this in the Final Supplemental EIS would answer specific requests made during the scoping process for information on the environmental effects from "hazardous materials used in construction" (EHA 1986).

RESPONSE TO LETTER 104

104-3 Please refer to the response to Comment 104-2.

104-4 Please refer to the response to Comment 56-100 for a discussion of hydrostatic test water disposal.

LETTER 104

104-5 4. What are the specific data sources used in the DSEIS, and why are they not presented in raw, tabular form or referenced? Where, when and by whom were any field studies completed, and where are those data and photographs?

In the scoping sessions, requests were made for field surveys to be conducted of river crossings EHA (1986). It was requested that these surveys be conducted by "competent professionals if it is not possible to obtain such data by other means". No indication was given in the DSEIS as to the number, dates of visit, data taken, or the qualifications of any persons conducting such field surveys. The purpose of this request was to provide details in the DSEIS sufficient to allow the location of routes "with the least potential ecological impact" (EHA 1986). No such detailed river crossing data was located in the DSEIS, however. Instead of field survey or literature-driven descriptions in the DSEIS which were requested, there is a repeated usage of generalized environmental descriptions which tend to understate the uniqueness of the environments considered.

104-6 5. The DSEIS is based upon a limited data base from which broad, sweeping and unsupported generalizations are often made.

The descriptions in the text provide details on features which are site specific, and then generalizes them to the rest of a drainage. For example, it appears that the substrate at river crossings was characterized at a few points on the river, and the results from this sampling generalized to include all downstream habitats. The criteria to support this extrapolation were not found in the DSEIS. These data were used to report findings on suspended sediment transport during river crossing construction, and are therefore critical to endangered aquatic species management.

104-7 6. There is inadequate verification of the sedimentation loading data, and details on how and where it was collected.

Comments from EHA (1986) requested information to allow the examination of, "erosion of construction areas and resulting sedimentation of creeks, rivers and other aquatic habitats..." This data should be provided in tables in the appendices of the Final Supplemental EIS.

RESPONSE TO LETTER 104

104-5 The current CEQ guidelines dictate that conciseness is required, preferrably within 300 pages in length. Obviously, we have not maintained that page restriction; however, we have tried to be as concise as possible, especially by providing summaries of our own field data and the data of others rather than the raw data. Please refer to the response to Comment 52-13 for information concerning the completion of field studies.

104-6 Please refer to the response to Comment 56-108 and Modifications and Corrections section for page 4-36.

104-7 Please refer to the resposes to Comment 56-108 and Modifications and Corrections section for page 4-36.

LETTER 104

7. Documentation is needed to support the statement that the existing level of sedimentation in the rivers to be crossed makes the increased sediment loading inconsequential in certain cases.

104-8 Whether the fishes of the rivers to be crossed are already subjected to, "continual exposure to natural sedimentation", is not used in the proper context. This naturally occurring sediment load has led to a slow and natural selection of species which are adapted to it; it does not follow, however that they will adapt for this reason to any sudden and short-term bursts in sediment loading. No description of the types of sediments to be released into the rivers is made. Of special interest would be the effect of the disturbance of aerobic or acidic soils on water quality; in this case anticipated changes should be discussed for pH, dissolved oxygen and biological oxygen demand.

8. The maps which show the pipeline need to be prepared at a scale allowing a reviewer to make an independent assessment without having to go into the field himself or herself. Using maps at 1:100,000 or 1:250,000 scale gives a very general view of the environment, and tends to understate its uniqueness and complexity. The analysis should address issues at the level of detail of a 1:24,360 USGS topographic map. This is the detail which an investigator studying these sites would need to locate features (eg. the pipeline route, river crossings, check valves, etc.) which are discussed in the DSEIS. The maps used in the DSEIS are inadequate to allow even the placement of block and check valves with any degree of accuracy. It is difficult, if not impossible for even a professional environmental scientist to distinguish water from land on the maps provided in the DSEIS. For this reason, it seems, the Pedernales River and drainages were crossed nearly a dozen times by the proposed route, as were houses, lakes, and cemeteries along the way. The final supplemental EIS needs to provide detailed maps of the most critical areas, such as river crossings. Definitions and criteria need to be explained for the placement of block and/or check valves along the proposed route. Is their selection arbitrary? What is a major river crossing? Can't as much oil from a pipeline rupture enter from feeder creeks and gullies as from under the main river crossing? Unless these details are considered for each river, how will the best route be selected? To further emphasize this point, included is a photograph of a site near Mountain City which is shown in the DSEIS as the location for a check valve on the pipeline; the site, however is far from any water drainages and appears to constitute a phantom check valve (Figure 7). This causes some doubt as to the accuracy of the other check and block valves which have been included in the DSEIS at river crossings.

104-9

RESPONSE TO LETTER 104

104-8 The types of river bed materials along the route range from silts to boulders to bedrock. Table 3-5a in the Modifications and Corrections section summarizes the river bed materials at the major river crossings. Typically, the eastern portion of the routes contains river-bed sediments consisting of alluvial flood plain materials which consist of silts and sands with some gravels. In the western portion of the routes, the river bed sediments are generally gravels and cobbles with some sand. Occasionally there is exposed bedrock.

Table 3-5a summarizes water quality data collected by the USGS at four river crossings. The data are representative of other crossings where the USGS maintains a water quality station. These four crossings were selected to present a range of sizes of streams which had a wide discharge range. Over a wide range of river discharges and sediment transport rates, the changes in pH, dissolved oxygen, and biological oxygen demand did not vary significantly. The maximum variation in pH was 7.5 to 8.5 on the Colorado River. Dissolved oxygen ranged from 7.0 to 11.0 mg/l in Cibolo Creek. Biochemical oxygen demand ranged from 1.7 to 5.8 mg/l in Cibolo Creek. We do not expect to see any abnormal variations in the pH, dissolved oxygen, or biochemical oxygen demand at the river crossings due to disturbance of the river beds.

Please refer to the response to Comment 56-23.

104-9 The environmental impact assessments for all disciplines were conducted using USGS topographic maps at a scale of 1:24,000 and aerial photographs. It was not practical to include these maps in the SEIS for the 1,500 miles of pipeline route analyzed. Therefore, maps at a scale of 1:250,000 were used in the SEIS to show the locations of the routes and to identify the sensitive receptors or features along each route. More specific maps for the location of threatened and endangered species are included in Appendix E of the Draft SEIS.

The environmental impact assessments for all resources were based on the location of block and check valves in AAPL's design. Based on the determination of significant impacts to sensitive resources, BLM then recommended the addition of remote-control block valves at certain sensitive locations to mitigate these impacts. Please refer to the Modifications and Corrections Section 3.2 for Table 4-62 for a list of the recommended remote-control block valves and the sensitive resources at each downstream location.

Please refer to Modifications and Corrections section for pages 4-4 and 4-20 which describe the rationale behind placement of block valves. The Mountain City block valve cited by the comment was located to protect the Edwards Aquifer recharge zone.

LETTER 104

9. Inadequate level of detail is provided to determine effects of the pipeline on threatened and endangered species.

104-10 The industry standard for large project EISs is to provide a page or two of specific information for each important species potentially impacted by the project. In the DSEIS, the reviewer is provided with a large number of tables containing a cornucopia of data on every species in the area, and then asked to evaluate the effects. This tends to understate the possible specific effects for species in the path of the pipeline which may be effected. In EHA (1986) it was requested that for for each of these special status species an evaluation conforming to criteria required by Section 7 of the Endangered Species Act be prepared. Missing from the DSEIS was a section which was organized on a species-by-species level to address the detailed advantages and disadvantages for their populations as they are related to each alternative route.

10. The DSEIS provides inadequate consideration of seasonal constraints to be imposed during construction operations.

104-11 Except for considering flow periods from a hydrographic and economic point of view, there was an inadequate level of attention paid to reducing environmental impacts by timing construction activities to coincide with noncritical periods for aquatic species. For example, most fishes in the freshwaters of Texas are known to spawn in the spring and summer. This should be considered when timing the construction of pipelines across riverbeds. Along the selected route, the spawning seasons of all threatened and endangered fishes in the river drainage should be depicted, and the "windows" for construction determined and illustrated. Since construction at each river crossing is scheduled to take an average of 6 weeks, and the siltation effects are expected to last 2-3 weeks, the need is for a 9 week window between critical spawning periods in each stream.

11. The DSEIS provides the reviewer with an unrealistic assessment of the actual damages from the pipeline construction process itself, especially in the short run.

104-12 In the DSEIS, the clean, engineering drawings showing the type of activities associated with construction are misleading. Actual activities (Figure 6) may result in dramatic and significant habitat removal, especially when constructing a pipeline of this size. This will be especially true where the pipeline is proposed to cross riparian vegetation and wetland environments; discussions of environmental consequences in these critical areas should be in the Final Supplemental EIS.

RESPONSE TO LETTER 104

104-10 There is no "industry standard for large project EISs" used for impact analyses of threatened and endangered species. A separate section on threatened and endangered species is provided for each alternative in the Draft SEIS: Section 3.2.6.3 (Proposed), Section 3.3.6.3 (Northern Alternative), and Section 3.4.6.3 (Southern Alternative). These sections provide a discussion of known distribution, population size, and preferred habitat (if known). Summaries of life history events and habitat for these species are provided in Appendix E, Tables E1-2 and E1-3. Impact evaluation sections for each alternative list the threatened and endangered species known to occur downstream of the proposed crossings. Since oil toxicity information is lacking for the threatened and endangered species, there is no advantage to organizing impact discussions by species.

In accordance with Section 7 of the Endangered Species Act, ERT prepared a Biological Assessment under the direction of the BLM. This document contains the detailed information on potentially-affected classified species that you are referring to. Only summary material is included in the Draft SEIS, however, more detail is provided in the Draft SEIS Appendices as specified above. The reviewer is directed to the Draft SEIS Appendices, the Biological Assessment, and ongoing Section 7 consultation file material for additional information on threatened, endangered, and other special status species.

104-11 As discussed in the response to Comment 56-23, there are no significant construction-related impacts expected for aquatic species. Therefore, a mitigation measure dealing with the timing of construction to avoid critical periods is not needed. AAPL has indicated that river crossings would be constructed during periods of low flow.

104-12 We feel our impact assessments are reflective of potential impacts. Mitigation Measures TB-1 and S-1 in Appendix A are designed to mitigate wetland and riparian impacts.

LETTER 104

12. The DSEIS is inadequate in delineating the location of critical habitats; the place to provide this review would be in the Final Supplemental EIS not in subsequent documents.

104-13 The identification of critical habitats should be part of the Final Supplemental EIS, not deferred until after the project is approved and underway. The DSEIS is inadequate in providing details for (or maps of) more than 7 sensitive areas. These are presented only in an oil spill contingency plan without plans for mitigating construction or other operational conflicts. Areas which are extremely critical to coastal fisheries such as the Chocolate Bayou river system and its associated marshes should have been selected and given greater and more detailed coverage (Figure 8). As recommended in EHA (1986), "The vegetation communities and wildlife habitats should be mapped for each route using aerial photography, supplemented by ground-truthing of each alternative." These maps should show areas critical to threatened and endangered species during their critical seasons. This map series should then be used to develop a comprehensive oil spill planning document for the river systems with the greatest potential for oil spill damages. The effort could be modelled after those done for the Apalachicola and Columbia Rivers (Dahlin et al. 1984; Sutherland 1979).

RESPONSE TO LETTER 104

104-13 Your comment regarding the delineation of critical habitat areas by mapping is noted. Additional aquatic areas have been identified in the impact discussion. However, as a result of the wide geographical area involved, it is not considered appropriate to map all sensitive areas unless significant impacts are likely. Also, please refer to the response to Comment 104-10.

LETTER 104

SITE- AND SPECIES-SPECIFIC CRITIQUE OF THE DSEIS (ISSUES 13-20)

After conducting a review of the DSEIS and the field work, 8 site and species-specific inadequacies were identified, including the following.

104-14 13. The DSEIS coverage of the Pedernales River is inadequate to allow review of potential environmental effects.

This river system was studied in January 1987; field stations 1-8 were studied at this time (Figure 5). Figure 9 shows one of the stations studied. The DSEIS provides inadequate protection and discussion of this important water body. The proposed pipeline crosses the river or feeder streams no less than ten times; only 2 block and/or check valves are provided for these ten crossings. It is suggested that more careful planning of the pipeline route would reduce the number of crossings, and therefore the amount of risk due to spilled oil into this water body. To cross the river and feeder streams this many times is judged excessive and would likely result in excessive siltation of the stream, and possibly lead to unnecessary effects to macroinvertebrates and fishes residing there. With fewer crossings, this situation could be avoided, since as the DSEIS states, the increase to sediment load would be slight due to stream bed composition of cobbles and gravel in the Pedernales River. Perhaps with only one river crossing, there would not be enough sediment loading to interfere with endangered and threatened species. Of all of the rivers observed along the proposed pipeline route, the Pedernales is among the most critical as a source of drinking water to livestock. The effect of an accidental oil spill on these livestock is not adequately addressed in the DSEIS. There are also gravel mining operations along the Pedernales which would be effected by such a spill.

104-15 14. The DSEIS coverage of the Colorado River is inadequate to allow review of potential environmental effects.

This river system was studied in March 1987; stations 17 and 35 were studied at this time (Figure 5). Figure 10 shows one of the stations studied. Special consideration should be given to use an elevated pipeline crossing over this river; this would prevent subsequent erosion and breakage of the pipeline, and would reduce the possibility for a significant increase in sediment loading during construction. Figure 10 shows the river a few miles downstream from the proposed crossing. An oil spill at this site would be quickly transported downstream toward the coast. Access to the river banks is fairly restricted by vehicle at this part of the river, so a spill response would likely be carried out by

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104-14 When the route was transposed on to different scale maps (1:24,000 and 1:250,000) it appears that the Pedernales River is crossed numerous times. Based on detailed engineering plot plans, the Pedernales River is crossed by the Proposed Route only two times. There are block and check valves at each crossing. Booms can be installed near gravel mining operations along the Pedernales to divert oil spills.

104-15 The concern for protection of oil spill impacts on aquatic resources in the Colorado River is noted. The final Oil Spill Contingency Plan will include site-specific plans for this crossing; see Modifications and Corrections section for page B-53 and Table B4-1a.

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104-15 Cont.

boat. No mention of an aquatic protection and cleanup methodology for this river was made in the DSEIS. Oil would tend to accumulate on the point bars and other depositional parts of the river downstream from the spill site. At the mouth of the Colorado River, the DSEIS needs to consider the potential for damages to sensitive environmental resources in the Intercoastal Waterway, and to the shallow water environments in the Gulf of Mexico.

104-16

15. <u>The DSEIS coverage of the Brazos River is inadequate to allow review of potential environmental effects.</u>

This river system was studied in March 1987; field station numbers 20-24 and 33 were studied at this time (Figure 5). Figures 11 and 12 show 2 of the stations studied at this time. Special consideration should be given to placing an elevated pipeline at crossings for all major rivers along the proposed route. Otherwise the Brazos River would suffer a significant increase in sediment loading during construction. Such an elevated pipeline crossing at this point would reduce risks associated with construction or operation of the pipeline in the rather strong river currents. This is especially critical, since the area indicated for the pipeline crossing is fairly remote, with access to only one side of the river; access to the river improves greatly immediately downstream. The area which is fed by the river just downstream from the pipeline crossing is a bald eagle nesting area. Feeding the Brazos River just downstream from the proposed pipeline crossing is a major tributary, which is not mentioned in the DSEIS; this is the Rabbs Bayou. Some mention of the critical resources of this water body need to be made since there are some marshy areas and extensive riparian vegetation associated with it. This part of the Rabbs Bayou may be critical to protect since it may be a feeding for bald eagles which are known to concentrate and nest in this area. Furthermore, there are more areas of bald eagle nesting downstream from this crossing point on the Rabbs Bayou. The Rabbs Bayou is remote, which would severely inhibit attempts at cleanup and collection of oil during a spill. A check/or block valve needs to be placed at the point where the proposed pipeline crosses the Rabbs Bayou (approximately 29 degrees, 27-1/2 minutes north; 95 degrees, 36 minutes west) to protect this water body. As with other remote areas, the road into the crossing of the Rabbs Bayou, and the pipeline corridor have the potential to remove abundant riparian vegetation. The mouth of the Brazos River at Freeport is an area which will demand more attention in the Final Supplemental EIS. Many of the coastal resources which would be effected are associated with the port of Freeport, including the boats in the harbors and basins and the shallow waters of the Intercoastal Waterway (Figure 11). Numerous sheltered wetlands are associated with the Intercoastal Waterways, and were not treated in adequate detail in the DSEIS.

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104-16 Please refer to Comments 56-108 and 104-8 regarding increased sediment loads during construction. Also, please refer to the Oil Spill Contingency Plan in Appendix B of the Draft SEIS, the Modifications and Corrections section for page B-53, and Table B4-1a in Section 3.2 of the Final SEIS for site-specific oil spill plans.

Elevated pipe crossings of rivers were not considered for system safety reasons. not considered. Most large pipelines are buried rather than suspended at river crossings. Suspended crossings are subject to impacts similar to bridges such as washouts, and are subject to collecting debris during floods. Vandalism and accidental rupture by equipment or vehicles are also risks.

Your comment concerning critical resources in Rabbs Bayou, a tributary with some marshes and extensive riparian vegetation downstream of the Brazos River crossing, is noted. Closer review of the Rabbs Bayou area indicates that it is a tributary to Big Creek which eventually flows into the Brazos River. The Rabbs Bayou-Big Creek-Brazos River area is part of the Brazos Bend State Park. However, TPWD does not have site-specific data on the aquatic resources of Rabbs Bayou. To protect these resources, a site-specific Oil Spill Contingency Plan will be prepared for this crossing; please refer to the Modifications and Corrections section for page B-53.

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16. The DSEIS coverage of the San Bernard River is inadequate to allow review of potential environmental effects.

This river system was studied in March 1987; field stations 18, 19 and 34 were studied at this time (Figure 5). Figure 13 shows the extensive riparian vegetation and the swollen condition of the river at the time of this visit. Of all of the rivers along the proposed route, this one appears to have the greatest potential for oil spill damages to riparian vegetation. When examining the proposed protection for the river offered in the DSEIS in some detail, it became apparent that the river is inadequately protected by block and/or check valves. The DSEIS provides 2 of these, one each for Middle San Bernard Creek and for the San Bernard River itself; its fails however to provide a block or check valve for at least 3 other crossings which it makes of this critical drainage. These crossings are at Eagle Branch and two other unnamed branches of the river (located at 29 degrees, 33 minutes north; 96 degrees, 5 minutes west and at 29 degrees, 33 minutes north; 96 degrees, 3 minutes west). The extensively developed riparian vegetation surrounding this river immediately downstream from the proposed crossing, makes access to the river difficult at best. It would be difficult if not impossible to protect the environment or to clean it up from an oil spill occurring at any of the 5 crossings of this river. Recommended protection plans for this critical river include the rerouting of the proposed pipeline to cross the river in only 1 or 2 places, by moving the crossing north about a mile. Furthermore, an elevated pipeline route is suggested both where the pipeline crosses riparian vegetation, and where it crosses the river itself. It is suggested that an area be selected for the crossing which has an existing cleared area through the riverine vegetation. There are at least 4 such pipeline crossings close the one proposed in the DSEIS. One crossing is cleared of riparian vegetation, and is about 3 miles north of the proposed crossing. At this crossing, the pipeline would have to cross the San Bernard River system only once, instead of 5 times as proposed in the DSEIS. The suggestion for an elevated pipeline would allay certain concerns for the effects of the construction activities on the San Bernard River system. The river's aquatic animals may be more sensitive to construction-related activities than those found at other rivers in the area. As pointed out in the DSEIS, the river would suffer a significant increase in sediment loading during construction. The specific recreational usages of the lower, navigable portions of the San Bernard River should be addressed in better detail in the Final Supplemental EIS. Landowners along this part of the river have docks, water intakes and recreational vessels in this water body which could be severely damaged by a released of spill oil at the upstream river crossing. At the mouth of the San Bernard River, there are a number of critical and oil sensitive coastal resources which could suffer long-term damages from a large oil spill, and which need to be more adequately addressed in the Final Supplemental EIS. These included the Cedar Lake system, the

104-17

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104-17 The San Bernard River is a relatively small south Texas river. Please refer to Comments 56-108 and 104-8 for increased sediment impacts during construction.

The comment concerning construction-related impacts on aquatic animals in the San Bernard River is noted. There is no evidence that construction activities would result in larger sediment increases than other rivers crossed by the pipeline. The discussion of sediment-related impacts on aquatic communities in the response to Comment 56-23 also applies to this comment. No long-term impacts on aquatic species from construction would be expected, since no critical or unique spawning or nursery areas are known to occur downstream of the crossing. As previously stated in the response to Comment 56-23, sediment increases due to construction of the pipeline are 2 to 3 percent and with a range tolerable by the aquatic biota in the San Bernard River.

Your comment regarding a more adequate discussion of coastal areas at the mouth of the San Bernard River is noted. Please refer to the Modifications and Corrections section for page 3-38. The Gulf Coast area near Freeport is listed as a sensitive area to potential oil spills, as discussed on page 4-57, paragraph 2 of the Draft SEIS. As indicated on Table 4-62 in the Modifications and Corrections Section 3.2 and in Mitigation Measure SS-2 in Appendix A of the Final SEIS, a remote-control valve is proposed for the San Bernard River.

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104-17 Cont.

wetlands of the Intercoastal Waterway, and the shallow nearshore waters of the Gulf of Mexico associated with the river mouth. The Cedar Lakes are extremely sheltered and dominated by tidal wetlands, and are inadequately addressed in the DSEIS. The Final Supplemental EIS needs to address the specific sensitivity of these lakes and the protection methods which will prevent heavy amounts of spilled oil from entering them and causing potential long-term damages there.

104-18

17. The DSEIS coverage of Oyster Creek is inadequate to allow review of potential environmental effects.

This river system was studied in March 1987; field station numbers 23, 25, and 26 were studied at this time (Figure 5). Figure 14 shows one of the stations studied. The DSEIS is inadequate to provide protection for several crossings of the proposed pipeline over Oyster Creek at approximately 29 degrees, 26-1/2 minutes north; 95 degrees, 30 minutes west. These check and block valves are considered critical, since Oyster Creek is crossed a number of times where it is a relatively small stream with low flow and extensive backwater areas; this makes it one of the more sensitive rivers in Texas to long-term oil spill effects. Downstream effects from a sizable rupture could be devastating due to the number of acres of riparian vegetation directly supported by the water body. The extensive salt marsh ecosystem downstream from these crossings also leads to requirements for their protection by check and block valves at the river crossing.

104-19

18. The DSEIS coverage of Chocolate Bayou is inadequate to allow review of potential environmental effects.

This river system was studied in March 1987; field station numbers 27 and 31 were studied at this time (Figure 5). Figure 8 shows one of the stations studied. This is a relatively small stream with low flow near its headwaters and adjacent to the proposed pipeline crossing. In the coastal areas, Chocolate Bayou expands into a large area of coastal wetlands, which makes it one of the most susceptible routes in Texas to long-term oil spill effects (Figure 8). Where the river system enters Chocolate Bay, extensive salt marshes dominate the shoreline. These marshes are vulnerable to long-term damages from spilled oil, as would result from a worst-case release of oil from a ruptured pipeline. Chocolate Bay feeds into West Bay, which is part of the rich and productive Galveston Bay estuarine ecosystem. This is an area which is especially vulnerable to oil spills due to its high productivity and importance to commercial and recreational sportfisheries. Where both the proposed route, and the Texas City lateral route cross over the Chocolate Bayou drainages, there is inadequate protection provided against a catastrophic release. No check and/or block valves are provided specifically for these waterways

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104-18 The comment concerning a more adequate discussion of Oyster Creek is noted. The salt marsh ecosystem located downstream from the crossing is mentioned in the response to Comment 104-10. In addition, please refer to the Modifications and Corrections section for page 3-35. A remote-control block valve is proposed at Oyster Creek to protect the sensitive aquatic resources downstream of this crossing; please refer to Mitigation Measure SS-2 in Appendix A.

104-19 The pipeline crosses the headwaters of Chocolate Bayou. Chocolate Bayou is intermittent at the crossing and typically only flows after large rains. Also, the lower reaches of this bayou are wide and deep which would facilitate the use of booms and skimmers to contain and cleanup any oil spills.

The importance of West Bay (Galveston Bay) in terms of marine resources is discussed on page 3-36, paragraph 5 and page 3-38, paragraph 2 of the Draft SEIS. Specific reference to the salt marshes and wetlands is provided in a revision; refer to the Modifications and Corrections section for page 3-36. A block and check valve has been added for Chocolate Bayou; please refer to Mitigation Measure SS-2 in Appendix A.

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104-19 Cont. which would prevent large amounts of oil from entering a wetland area where oil cannot (and in some cases should not) be recovered. All routes crossing the Chocolate Bayou drainages should be provided with specific check and/or block valves which would minimize this extent of oil induced damages.

104-20 19. The DSEIS coverage of Highland Bayou is inadequate to allow review of potential environmental effects.

This river system was studied in March 1987; field station numbers 28-30 were studied at this time (Figure 5). Figure 15 shows one of the stations. This is a relatively small stream at the proposed pipeline crossing, with low flow and extensive backwater areas, which makes it one of the more sensitive rivers in Texas to long-term oil spill effects. The salt marshes downstream from the pipeline crossing are extensive (Figure 15), and would be heavily damaged from an oil spill. The salt marshes which are at greatest risk are those associated with Jones Bay, which is a part of the Galveston Bay estuary. Any heavy oiling reaching the marshes of this area would likely result in a long term damage, which could indirectly effect both the water quality and productivity of the estuary. The DSEIS is inadequate in providing discussion about the protection for this water body since no block or check valves are provided specifically for this area. Recommended are specific check and/or block valves at the proposed crossing site (approximately 29 degrees, 20 minutes north; 95 degrees, 57-1/2 minutes west). This is the crossing proposed for the Texas City Lateral route. This section crosses more salt marsh and offers more potential for natural resource damage than any other section mentioned in the DSEIS. Considerations should be made to provide an elevated pipeline over the Highland Bayou. The relatively inaccessible nature of the downstream shoreline in this area, makes it vulnerable to long term damages from an oil spill. It is extremely difficult to get personnel and equipment into wetlands to effect a cleanup. No roads are available, so that the response would have to be entirely by boat, which would be slow and inefficient; in the case of a large spill there would no practical way to protect the downstream environment, or to clean it once it was oiled.

104-21 20. The DSEIS coverage of the Guadalupe and the striped bass are inadequate to allow review of environmental effects.

Guadalupe bass are found in the major rivers along the proposed route. The DSEIS provides no information on the tolerance of the Guadalupe bass to fractions of spilled oil, or of the ability of the species to tolerate elevated sediment levels. While this data may not be available for the species itself, it is probably available for other bass (largemouth and smallmouth) or at least for a family member (at worst), and should be provided, so that an

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104-20 Your comment regarding inadequate protection for Highland Bayou is noted. Remote-control block and check valves are part of the mitigation for Highland Bayou (see Table 4-62 in the Modifications and Corrections Section 3.2).

The bayou will also receive a site-specific Oil Spill Contingency Plan; please refer to the Modifications and Corrections section for page B-53. For reasons of pipeline protection no above-ground pipeline installations are proposed.

104-21 The comment concerning inadequate impact analysis for the Guadalupe bass and the striped bass is noted. A summary of known available oil toxicity data for any fish species occurring in the project study area is provided in Table 4-16, page 4-55 of the Draft SEIS. There are no known studies for the Guadalupe bass, largemouth bass, or smallmouth bass. Data are available for other species in the family such as bluegill. The table also indicates toxicity data for the striped bass, which appears to be one of the most sensitive species. This statement is made on page 4-54, paragraph 4 of the Draft SEIS.

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104-21 Cont.

extrapolation on effects could be made and evaluated. Striped bass are also found in the major rivers which are crossed by the proposed route. There are few species of fish for which there is more information available on the effects of toxic materials on their life history (French and Getter 1984). This information should be provided in more detail for the species, and evaluated in light of a more realistic worst case scenario. Striped bass represent perhaps the most sensitive sport fish in the rivers crossed by the proposed route, and could suffer up to 2 years of impact in a river which received a large oil spill.

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CRITIQUE OF SELECTION OF ALTERNATIVE ROUTES FOR THE PIPELINE

If according to the DSEIS, the stated purpose of inland pipelines is in part to, "prevent oil spill damages to the marine environment", then placing the All American Pipeline anywhere near these environments is counterproductive. During the Ixtoc I oil spill offshore in 1979 (Figures 16 and 17) the strategy was to keep the offshore oil out of the most sensitive portion of the marine environment; these are the inner or secondary bay regions (Figure 18) which are critical as nursery grounds for important commercial and recreational fisheries. Ironically the All American Pipeline, were it to rupture at one of the most critical river crossings (San Bernard River, Chocolate Bayou, Highland Bayou, etc.), could send massive quantities of oil directly into these primary and secondary bays, which are among the most sensitive marine environments in Texas. In short, the All American Pipeline in a few hours could be a worse threat to the estuaries of Texas than an offshore well blowout sustained for over 6 months, but contained at the inlets. 104-22

The southern alternative route is the poorest route selection since it crosses the most coastal rivers, is closest to the marine environment, and crosses remote areas where response would be impaired by lack of access. In most ways the southern route is more sensitive that the proposed route. The southern route has the highest number of streams crossed with important fish populations of any route considered (20 total); it has the highest number of federal and/or state listed aquatic species potentially effected; finally, it has the greatest amount of riparian vegetation disturbed (21.5 miles; 260 acres) of any route considered. Specifically, there are 7 species of threatened or endangered fishes which are found in the rivers and downstream reservoirs of the southern alternative, including the following: the prosperine shiner (Devils River, Las Moras Creek, Pinto Creek); the Devil's River minnow (Las Moras Creek, Devil's River, Amistad Reservoir); the Rio Grande darter (Devil's River, Amistad Reservoir); the greenthroat darter (Nueces River); the Guadalupe bass (Devil's, Nueces, San Antonio, Guadalupe, Colorado, and Brazos Rivers) ; the blue sucker (Amistad Reservoir); and Conchos pupfish (Devil's River). 104-23

The proposed route, has been the subject of this report, and is not a much better choice with regard to aquatic and marine resources. It has the second highest number of coastal areas potentially effected and the second highest amount of riparian vegetation disturbed (11.5 miles; 140 acres). Associated with the proposed route in the DSEIS is the pipeline alternative to Texas City. This section of pipeline, considered in the DSEIS under the proposed pipeline route crosses more sensitive rivers adjacent to critical marine habitats than any other part of the proposed 104-24

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104-22 The comment concerning the effects of potential oil spills on the estuarine environments is noted. As discussed in the Draft SEIS, the rivers with no downstream reservoirs and relatively close proximity to the coast represent a pathway for oil to enter the estuaries. The Draft SEIS also discusses the importance of these estuaries in terms of fishery resources.

104-23 A summary of aquatic biology impacts has been written for each route. Please refer to the Modifications and Corrections Section 3.4. For a listing of impacts for each route, please refer to the Modifications and Corrections Section 3.2 for Table 2-12.

104-24 Please refer to the response to Comment 104-23.

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104-24 Cont. pipeline route. It receives little or attention in the text of the DSEIS; this particular section of the pipeline is judged to be so critical and to cross so much critical environment that it deserves at least equal treatment in the Final Supplemental EIS. It could even be argued that this section of the pipeline crosses such a unique and sensitive series of environments that it deserves a separate treatment or even a separate EIS.

104-25 The northern alternative route is the furthest from the coast, has the lowest number of coastal areas potentially effected; the lowest number of federal and/or state listed aquatic species potentially effected ; the lowest amount of water flow volume at river crossings of any route; and the least amount of riparian vegetation of any route with regard to miles and acres. The northern alternative route is therefore the least damaging with regard to aquatic and marine resources.

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104-25 Please refer to the response to Comment 104-23.

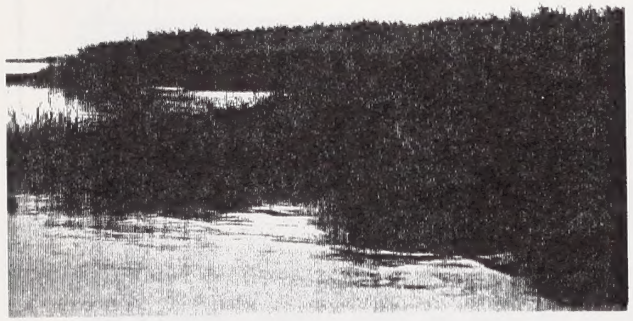

Figure 1. Oiled wetlands in the Delaware River following an oil spill by the tanker Grand Eagle in 1985. Consideration should be given to riverine wetlands downstream from pipeline crossings, even though they are known to recover from oil spills rapidly.

Figure 2. Oiled wetlands in a freshwater marsh in Panama following the overflow of an oil/water separator in 1985. Sheltered wetlands which have been heavily oiled usually suffer long-term damages; they are difficult to clean and protect.

Figure 3. Oiled wetlands in a salt marsh in Chile, resulting from the spillage of a tanker. These wetlands were estimated to have suffered a 50 plus year impact from this spill. Photo courtesy of Roy Hann.

Figure 4. Oil which has penetrated inlets may cause extensive damage to coastal wetlands as seen in this aerial photo of the salt marshes at Ille Grande, France following the massive spill of the Amoco Cadiz in 1978.

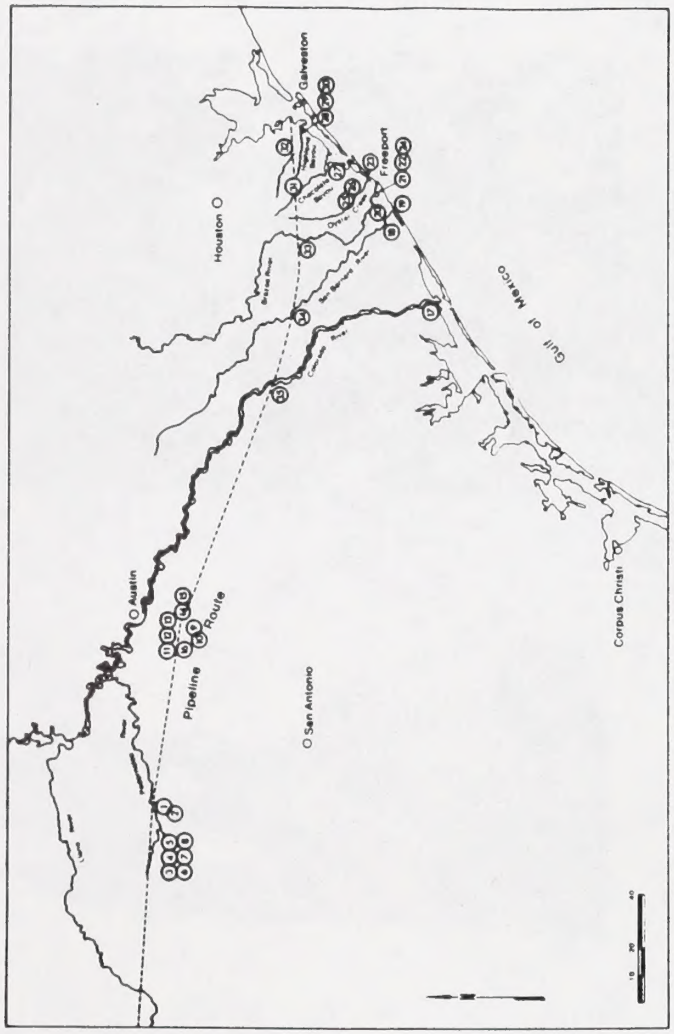

Figure 5. Map of proposed pipeline route (dashed line), critical river crossings, and thirty five field stations studied during January and March 1987.

Figure 6. Pipeline construction near Oyster Creek through riparian and wetland environments resulted in the removal of vegetation and the disturbance of topsoil. Recolonizing vegetation is often less supportive to dependent wildlife.

Figure 7. A dry field where the DSEIS indicates protection by block valve; this is apparently a graphics error or an error in the gross scale used in the maps in the report. Photo taken southwest of Mountain City in March 1987.

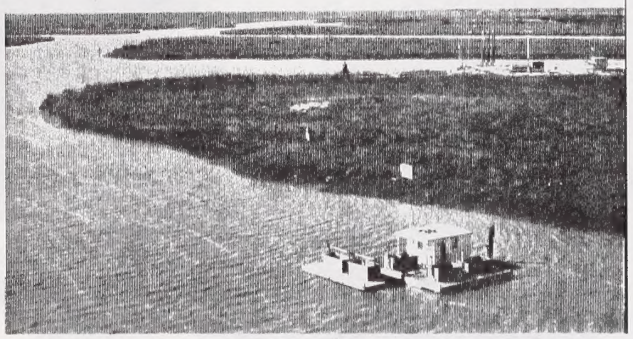

Figure 8. The mouth of Chocolate Bayou at Highway 1462 just upstream from Chocolate Bay in March 1987. These sheltered marshes are in the trajectory of a large spill occurring at the proposed pipeline crossing.

Figure 9. Vegetation-lined banks of the Pedernales River south of Fredricksburg, and downstream from a pipeline crossing studied in January 1987. The river supports recreational fisheries, drinking water and livestock watering.

Figure 10. The Colorado River at the Highway 90A bridge downstream from the proposed pipeline route taken in March 1987.

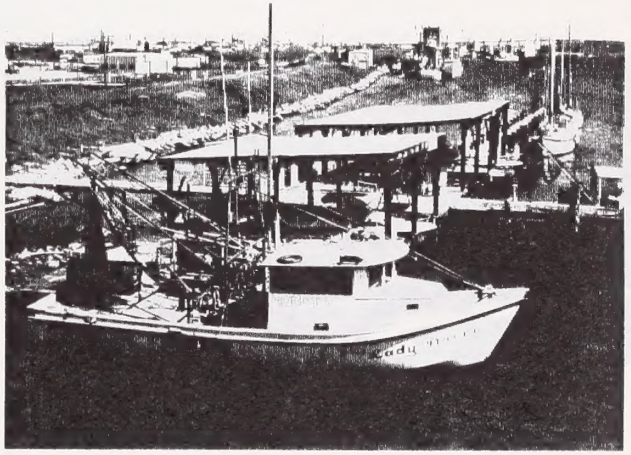

Figure 11. Commercial and recreational vessels in the basins and harbors around the port of Freeport downstream from the proposed pipeline crossing over the Brazos River. Photo taken in March 1987.

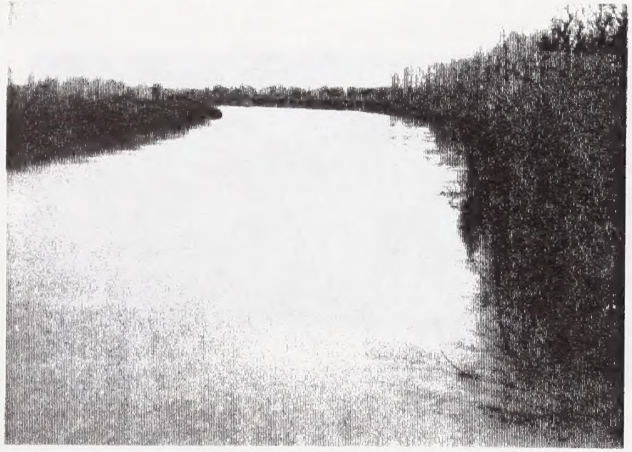

Figure 12. The Brazos River from the bridge at highway 59 downstream from the proposed pipeline taken in March 1987.

Figure 14. Salt marsh system near the mouth of Oyster Creek taken in March 1987.

Figure 13. Overflowing waters of the San Bernard River showing extensive development of riparian vegetation typical for the river at this point. Photo taken in March 1987.

Figure 15. Salt marshes at Highland Bayou in March 1987 which are susceptible to long-term damages from oil spills. This wetland system is downstream and vulnerable to oil spills from the proposed route and the Texas City alternate route.

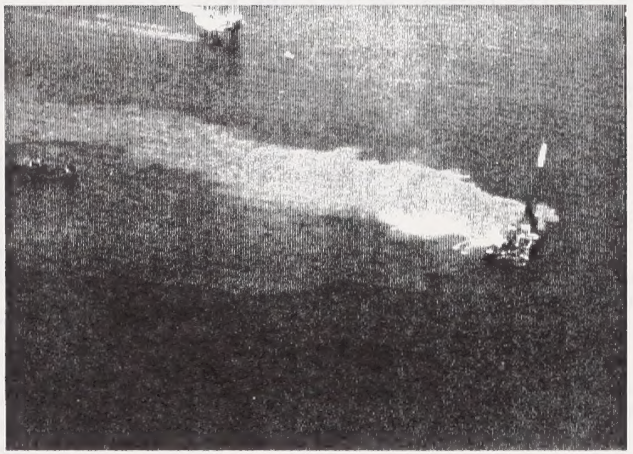

Figure 16. The fire and dispersant application at the spill site of Ixtoc I in the Gulf of Mexico in 1979. This spill threatened and was contained at the outer Texas coast; large quantities of oil failed to reach the inner estuaries therefore.

Figure 17. Large quantities of the oil from the Ixtoc I blowout failed to penetrate into the inner estuaries of Texas in 1979. Shown is one of the inlets into Laguna Madre being protected by the jetties, outer beaches, and booms.

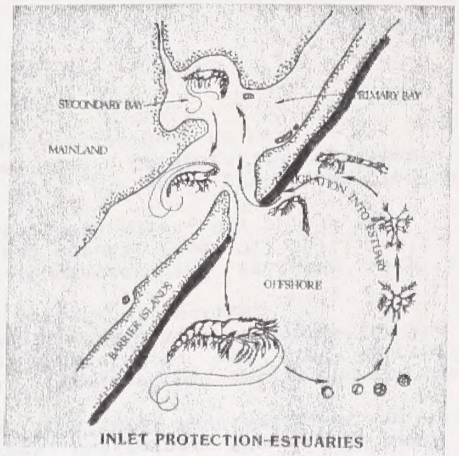

Figure 18. Oil which reaches through inlets to primary bays may damage coastal fisheries (such as the shrimp life cycle shown here). The All American pipeline affords a means to deliver oil via rivers into the most protected of Texas' estuaries.

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LETTER 105

J. W. HERSHEY
P. O. BOX 13244
HOUSTON, TEXAS 77219

March 31, 1987

Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Attention: Mr. William Haigh

Gentlemen:

Please include this letter in current proceedings with respect to the Environmental Impact Statement involving All America Pipeline Company (Celeron).

I own 1750 acres in Gillespie County, Texas through which All America Pipeline Company propose to construct a portion of its pipeline and for which I have been offered and refused a right-of-way agreement.

105-1 I am adamantly opposed to the location of a part of this pipeline in Gillespie County overlaying the Edwards Acquifer, which is the source of water supply for Austin and San Antonio and many of the smaller towns in the area. The statements with respect to precautions taken and insurance against degradation of sub-surface environment are, in my opinion, completely inadequate and not commensurate with the risks.

105-2 Another aspect that has not received adequate consideration is the possible effect on vegetation and, in particular, the live oak trees of Gillespie County which make it an attractive tourist destination. The Hill Country has been afflicted during the past several years with a mysterious oak tree disease colloquially known as "oak tree decline". No one knows exactly how this disease is transmitted but it is entirely possible that it is transmitted by particles of ground substances. Therefore, construction involving bull dozers, blades, ditchers, etc., may pose an additional distributive mechanism for the spread of this disease.

RESPONSE TO LETTER 105

105-1 Your comment regarding your opposition to the Proposed Route in Gillespie County is noted. Please refer to the response to Comment 1-1 regarding the vulnerability of the Edwards Aquifer.

105-2 Your comment regarding live oaks in Gillespie County is noted. Construction will undoubtly remove some of these trees; however, the total loss is not considered significant.

LETTER 105

105-3 Having had considerable experience in the oil industry I have made inquiries from reputable sources concerning the reason why heavy sulphurous crude oil produced in California, which has large refining capacity, should move to Texas. There is strong evidence from these inquiries that the reason this oil may move to Texas is that the air quality standards in oil refining areas of Texas are much more lenient than California. If this is true, and I am convinced

105-4 it is, then All America Pipeline Company is not only exporting crude oil interstate from California to Texas but is also exporting bad air. Noting from the Press yesterday that All America Pipeline Company are beginning to pump three-million barrels crude oil to fill the line from California to McCamey, Texas, I would suggest that perhaps McCamey, Texas is where it should be refined, since the concentration of noxious products in the air would certainly be more acceptable there than in the congested, often-times heavily contaminated atmosphere of Texas City-Houston.

105-5 For these reasons I strongly urge that you require All America Pipeline Company to route its line either north or south of the Edwards Acquifer.

Sincerely yours,

J. W. Hershey

cc: Mr. Elgin Pape
2207 Danbury Drive
San Antonio, Texas 78217

Mrs. Anderson Todd
2370 Rice Blvd.,
Houston, Texas 77005

RESPONSE TO LETTER 105

105-3 Your comment regarding refining of heavy crude in Texas rather than California is noted. Please refer to the response to Comments 6-1 and 56-1.

105-4 Please refer to the response to Comment 105-3.

105-5 Your comment regarding the selection of the Northern Alternative and the Southern Alternative is noted. Please review Modifications and Corrections Section 3.2 for Table 2-12.

LETTER 106

RESPONSE TO LETTER 106

DEPARTMENT OF THE ARMY
SOUTHWESTERN DIVISION, CORPS OF ENGINEERS
1114 COMMERCE STREET
DALLAS, TEXAS 75242-0216

REPLY TO ATTENTION OF

Planning Division

25 MAR 1987

Mr. William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

We appreciate the opportunity to review the Draft Supplemental Environmental Impact Statement (SEIS) for that portion of the All American Pipeline Project which extends from McCamey, Texas, to the Texas Gulf Coast.

The following comments resulted from review by the Albuquerque, Fort Worth, and Galveston Districts and the Southwestern Division.

a. Subjects for which the Corps of Engineers have responsibility appear to be adequately addressed.

106-1 b. The project may require Department of Army permits in the Galveston District. Therefore, the developer should contact Mr. Marcos De La Rosa, Chief, Regulatory Branch, 409/766-3930, for a final determination and requirements for the permits.

c. No crossings of waters regulated under Section 10 of the Rivers and Harbors Act of 1899 were identified within the Albuquerque or Fort Worth Districts. Further, it appears the pipeline alignments meet nationwide requirements for utility line crossings of waters of the United States pursuant to Section 404 of the Clean

106-2 Water Act. However, when the final alignment is determined, the developer should contact Mr. Gary Burton, Fort Worth District, 817/334-3990, and Mr. Andy Rosenau, Albuquerque District, 505/766-2776, for a final determination of any permitting requirements.

106-1 Your comment regarding permits from the Galveston District is noted.

106-2 Your comment regarding Section 10 and Section 404 permits is noted.

LETTER 106

RESPONSE TO LETTER 106

Mr. Harold Green, FTS 729-2305, is the point of contact in this office should you need to follow up on any of the comments.

Sincerely,

Barry G. Rought, P.E.
Chief, Planning Division

LETTER 107

United States Department of the Interior

BUREAU OF MINES

P. O. BOX 25086
BUILDING 20, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

Intermountain Field Operations Center

March 24, 1987

Memorandum

To: William Haigh, Federal Project Manager, Bureau of Land Management, 1695 Spruce Street, Riverside, California 92507

From: Chief, Intermountain Field Operations Center

Subject: Review of draft supplemental environmental impact statement for the Proposed All American Pipeline Project, Texas, New Mexico, Arizona, and California

As requested, personnel of the Bureau of Mines have reviewed the subject document to determine whether mineral resources and mineral-related industries would be adversely impacted by the proposed project.

Four alternatives are discussed in the document: The proposed pipeline route, northern and southern alternatives, and a no project alternative. The existence of mineral and energy resources and their general locations are adequately discussed. Resources covered include caliche, chalk, ceramic and common clay, coal, lignite, soft lime, limestone, asphaltic limestone, oil and gas, industrial quartz sand, sand and gravel, sulfur, and uranium (p. 3-29, 3-126, 3-188).

107-1 The Mitigation Measures section states (p. 4-182) that the pipeline will be rerouted to avoid "all active and proposed mineral and energy extraction areas," thus avoiding significant impact on those areas. The application of that measure would result in rerouting the pipeline around the proposed Shell Oil Milam lignite mine and areas of oil, gas, sulfur, and gravel extraction activity near the Orchard Dome oil field. We believe that possible rerouting also should be considered around known mineral and energy resources, not just around those for which extraction has been proposed.

107-2 Caliche, coal, asphaltic limestone, and sulfur, described in the Affected Environment section of the document (p. 3-29, 3-126, 3-188), were not mentioned in the Environmental Consequences section (p. 4-44). Except for the proposed Shell Oil Milam lignite mine, minerals are not discussed in the Impact Summary tables (p. 4-197 to 4-212). We suggest that all mineral and energy resources discussed in the Affected Environment section be included in the Impact Summary tables of subsequent versions of the document.

RESPONSE TO LETTER 107

107-1 AAPL, during the ROW acquisition process, will negotiate with the landowners to minimize damage to existing operations, such as mining or oil and gas development. If damage is inevitable, AAPL will be required, as part of the ROW acquisition, to mitigate for those damages. If potential reserve loss is large, the cost of the ROW acquisition would be greater than that which preempted this use. Normally the pipeline would be realigned in these situations. Generally, the pipeline ROW would attempt to parallel roads and other features that are not to be developed in the future extraction process.

Your comment regarding rerouting around known mineral and energy resources has been noted.

107-2 Your comment regarding inclusion of all mineral and energy resources in the Impact Summary tables is noted; these have been omitted from the tables because the pipeline will have no significant impact on them. Only the proposed Milam lignite mine and Orchard Dome oil field have been judged to be impacted by the pipeline. Based on your comment, changes to Table 4-64 have been made. Please refer to the Modifications and Corrections section for page 4-203.

LETTER 107

107-3 Incidentally, we believe that some confusion may occur because of the inconsistent use of mine and oil field names. For example, at least five different variations are used in referring to the Shell Oil Milam lignite mine (p. 3-27, 3-126, 4-118, 4-182, 4-203). The Orchard Dome oil field is referred to in at least three different ways (p. 3-126, 4-118, 4-182). We suggest that subsequent versions of the EIS show more consistent nomenclature.

William Cochran

RESPONSE TO LETTER 107

107-3 Your comment regarding inconsistent use of mine and oil field names is noted; based on your comment, text changes have been made. Please refer to the Modifications and Corrections section for pages 3-27, 3-126, and 4-118 and Mitigation Measure G-4 in Appendix A of the Final SEIS.

LETTER 108

RESPONSE TO LETTER 108

THE STATE OF TEXAS

CURTIS TUNNELL
EXECUTIVE DIRECTOR

TEXAS HISTORICAL COMMISSION

P.O. BOX 12276 AUSTIN, TEXAS 78711 (512) 463-6100

RECEIVED
1987 MAR -9 PM 12:03
DISTRICT

March 26, 1987

Dr. William J. Sheffield
Environmental Protection Division
Office of the Attorney General
Post Office Box 12548
Austin, Texas 78711-2548

Re: All American Pipeline Project,
Draft Supplemental Environmental
Impact Statement (SEIS) (BLM, A2, A3, A5)

Dear Dr. Sheffield:

This office has completed its review of the Draft Supplemental Environmental Impact Statement for the All American Pipeline Project. We are attaching our comments on that document.

Thank you for your attention to this matter.

Sincerely,

LaVerne Herrington

LaVerne Herrington, Ph.D.
Deputy
State Historic Preservation
Officer

NK/LH/mesjr

attachment

The State Agency for Historic Preservation

LETTER 108

Comments - Draft Supplemental Environmental Impact Statement
All American Pipeline Project

108-1 Page S-3: We concur with the comment that neither of three alternative routes stands out as likely to affect more cultural resources. However as one of the cooperating State agencies we do wish to state our preference for the northern route where, all other factors equal, potential environmental impacts can be mitigated.

108-2 Pgs 3-62, 3-148 The background information concerning cultural resources is well written, succinct and captures at least the basics of the Texas Protection Planning Process (Brown et al 1982).

108-3 Page 3-67: We concur with the statement (paragraph 2) that site type names are merely general classifications and do not reflect the total range of activities carried out at that location nor the significance of the property.

108-4 Page 4-70: The criteria of adverse effect are now found in 36 CFR 800.9 (revised October 1, 1986).

108-5 Pgs 4-188 to 4-192: We are pleased to note the inclusion of the mitigation measures noted herein. Such measures are minimal, but serve to clarify the PMOA and make it specifically applicable to the pipeline east of McCamey. Further, the measures ensure continued compliance with the Programmatic Memorandum of Agreement and its amendments and at the same time the National Environmental Policy Act and the provisions of Civil Action No A-86-CA-141, in the United States District Court for the Western District of Texas, Austin, Division, between the BLM, the State of Texas and All American.

RESPONSE TO LETTER 108

108-1 Your comment regarding support for the Northern Alternative is noted.

108-2 Thank you for commenting.

108-3 Your comment regarding site-type names is noted.

108-4 Thank you for addressing the error. The original text for the Draft SEIS was written prior to publication of the revised 36 CFR 800 regulations in the Federal Register, and subsequent review overlooked the error. Please refer to the Modifications and Corrections section for page 4-70.

108-5 Your comment is noted. Please see the response to Comment 75-1 from the Advisory Council on Historic Preservation.

LETTER 109

RESPONSE TO LETTER 109

RECEIVED
1987 APR -6 PM 2:27

Texas Department of Health

Robert Bernstein, M.D., F.A.C.P.
Commissioner

1100 West 49th Street
Austin, Texas 78756-3199
(512) 458-7111

Robert A. MacLean, M.D.
Deputy Commissioner
Professional Services

Hermas L. Miller
Deputy Commissioner
Management and Administration

March 30, 1987

Mr. Tom Adams, Director
Special Projects
Office of the Governor
P.O. Box 13561, Capitol Station
Austin, Texas 78711

Subject: Proposed All American Pipeline Project
Draft Supplemental Environmental Impact Statement
U. S. Department of the Interior — Bureau of Land Management
Special Projects, Office of the Governor
TX-87-03-09-0001-50

Dear Mr. Adams:

Copies of the Draft Supplemental Environmental Impact Statement (DSEIS) for the Proposed All American Pipeline Project have been reviewed for their public and environmental health implications. The DSEIS contains two documents, the main document and its appendices. The DSEIS was prepared for the Department of the Interior — Bureau of Land Management by ERT, a Resource Engineering Company; it is dated January 1987.

The All American Pipeline Company is currently constructing a 1,247 mile pipeline to transport California crude oil from the Santa Barbara Channel in California to McCamey, Texas. An extension of the All American Pipeline is proposed to transport the crude oil from McCamey to distribution points on the Texas Gulf Coast.

The Texas extension of the All American Pipeline consists of a 486 mile, 30 inch diameter, 300,000 barrels per day, heated crude oil pipeline. The proposed pipeline originates at an existing tank farm at McCamey, Texas and terminates at a tank farm at Webster and a marine terminal at Texas City.

The DSEIS for the proposed All American Pipeline Project analyzes the environmental impacts of the proposed Texas extension of the pipeline and the pump/heater stations through construction, operation, maintenance, and abandonment. This DSEIS analyzes the impacts of All American's Proposed Route; two alternative routes - the Northern Alternative and the Southern Alternative; and the No Project Alternative. The Northern Alternative and the Southern Alternative were identified to provide optional locations for the pipeline in sensitive areas.

LETTER 109

Mr. Tom Adams
Page Two
March 30, 1987

The Texas Department of Health (TDH) comments regarding the subject documents are as follows:

109-1 It is this Department's belief that all such pipeline projects permitted to cross over the aquifers of this State should be closely monitored to assure no adverse public or environmental health conditions or impacts result from such pipelines.

109-2 Consideration should be given to assure proper quality control programs are incorporated into the project to guarantee proper pipeline materials, construction, testing, and failure reporting are utilized. Also, oil spill contingency plans should be developed and coordinated with pertinent State agencies including the Texas Department of Health.

We appreciate the opportunity to review and comment on the subject DSEIS for the Proposed All American Pipeline Project.

Sincerely,

David M. Cochran, P.E.
Associate Commissioner for Environmental
and Consumer Health Protection

MWR:fhk

cc: U. S. Department of the Interior
Bureau of Land Management
Bureau of Environmental Health, TDH
Public Health Region 4, TDH
Public Health Region 6, TDH
Public Health Region 8, TDH
Public Health Region 9, TDH
Public Health Region 11, TDH
Public Health Region 3/12, TDH

RESPONSE TO LETTER 109

109-1 Your comment regarding the desirability of environmental monitoring for pipeline projects crossing aquifers is noted.

The State's position supporting protection of aquifers is noted.

109-2 Please refer to page 2-12 of the Draft SEIS regarding quality control and inspection procedures to be used by AAPL. The BLM Authorized Officer will provide inspection of pipeline construction activities and ensure compliance with the project design and other specifications. BLM's intention is to include relevant Texas agencies in the Oil Spill Contingency Plan development. Please refer to Comment 6-15 and Mitigation Measure SS-3 in Appendix A.

LETTER 110

RESPONSE TO LETTER 110

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
ALLIED BANK TOWER AT FOUNTAIN PLACE
1445 ROSS AVENUE
DALLAS, TEXAS 75202

MAR. 3 1 1987

REPLY TO: 6E-FF

Mr. William Haigh
Federal Project Manager
Bureau of Land Management (BLM)
1695 Spruce Street
Riverside, California 92507

Dear Mr. Haigh:

In accordance with responsibilities under Section 309 of the Clean Air Act and the National Environmental Policy Act (NEPA), the Region VI office of the Environmental Protection Agency (EPA) has reviewed your Draft Supplemental Environmental Impact Statement (EIS) for the proposed extension of the All American Pipeline from McCamey, Texas to the Texas Gulf Coast. All American is currently constructing a 1,247 mile pipeline from Santa Barbara Channel in California to McCamey, Texas.

The Texas extension consists of a 486 mile, 30 inch diameter, 300,000 barrels per day (BPD), heated crude oil pipeline. The line originates from an existing crude oil storage tank farm at McCamey and will terminate at Webster and Texas City, Texas.

EPA has been actively involved with this project since August of 1984. EPA received from the State of California Lands Commission and the U.S. Department of the Interior, Bureau of Land Management (BLM), the Draft EIS for the Celeron/All American and Getty Pipeline projects. Following our review of the Draft Statement, the agency expressed environmental concerns with regard to surface and groundwater quality impacts associated with construction and operation of the project and therefore requested additional related information.

In January 1985, we received the Final EIS for review. Our review found that previous concerns had not been adequately responded to and new concerns were identified. Region VI EPA issued formal comments on February 25, 1985.

In summary, our comments identified continued environmental concerns with actions taken to initiate construction of the Texas extension from McCamey to the Texas Gulf Coast and found the Final EIS inadequate in complying with NEPA requirements. Specifically, the document failed to

LETTER 110

evaluate potential impacts and required mitigation associated with the Edwards Aquifer and the Edwards Recharge Zone.

EPA's concerns concentrated on the fact that a portion of the Edwards Aquifer immediately South of the proposed route is an EPA designated "sole source" aquifer pursuant to the procedures established under Section 1424(e) of the Safe Drinking Water Act. A sole or principal drinking water source is one that supplies fifty percent or more of an area's supply of drinking water. Once "sole source" designation is established, it becomes increasingly critical that any action that provides potential for or risk of contamination to the aquifer must be carefully evaluated. Any risk should be avoided if at all possible.

110-1 In addition to this designation, the EPA is currently considering a proposal to increase the protection of the northern portion of this aquifer. The Agency has been asked to designate this portion as a "sole source". If this portion of the project is designated, the applicant's preferred route would cross directly above the newly designated "sole source" aquifer.

In response to these concerns and other issues identified by State agencies, environmental groups, affected water users and landowners along the applicants proposed alignment, BLM elected to prepare the Supplemental EIS for the Texas extension to more fully comply with the requirements of NEPA.

The Supplemental EIS evaluates the impacts of All American's proposed route, two alternative routes--the Northern and Southern Alternatives--, and the No Project Alternatives. The BLM has selected the Northern Alternative as the preferred alignment to be considered in the environmental review process.

The following comments are offered for consideration in preparation of the Final EIS.

ALTERNATIVES

The Draft Supplemental EIS for the proposed All American Pipeline project analyzes the associated construction and operational impacts along three alternative routes. The applicant's proposed route would begin at McCamey, Texas, cross the Edwards Plateau, pass south of Austin and terminate at Webster, Texas. The applicant's route crosses the Edwards Balcones Fault and Edwards Aquifer Recharge Zone. This alignment is controversial in that the potential exists that an oil spill resulting from a pipe break or rupture could impact surface water in the recharge area and impact the Edwards Aquifer, a designated "sole source" water supply. The EIS explains that the probability of a pipeline break is small (once in several hundred years along the six mile segment affecting the recharge area). However, should a break occur, the spill would very likely penetrate into the aquifer in a worst case situation.

RESPONSE TO LETTER 110

110-1 Your comment regarding designation of the northern portion of the Edwards Aquifer as a "sole-source" aquifer is noted.

LETTER 110

In addition to the applicant's proposed alignment, two other alternative pipeline routings were considered which include the Northern and Southern Alternatives. Both are designed to minimize the crossing of shallow sensitive aquifers, especially the Edwards Aquifer.

The Northern Alternative follows a easternly course to McLennan County near McGregor, Texas and thence southerly to Webster. This route avoids impact to the Edwards Aquifer and the Recharge Zone. This route is the lead agency's, BLM's, preferred alternative and the one considered more suitable than the applicant's proposed route.

The Southern Alternative follows a more southerly route from McCamey to Kenney County thence due east to Webster and Texas City. The EIS explains that construction difficulties would present the most serious problem due to rugged, heavily dissected topograph that would have to be crossed. This route is twice as long as the applicant's route and would disrupt twice as much of the riparian vegetation. This alternative makes spill response to pipeline rupture extremely difficult resulting in the largest projected possible spill at any portion of the routes considered.

FINDINGS

110-2 Based upon these facts and environmental impact evaluations presented in the Draft Supplement, we find BLM's preferred Northern route to be the best choice of all the alignment alternatives. This route avoids direct and indirect impact to the Edwards Aquifer and Recharge Zone.

The EIS concludes that any spills associated with the Northern route can be quickly responded to and contained for cleanup with minimal impact to the environment. This is not the case for the applicant's route.

All American's route with the prescribed mitigation and safety measures does present a contamination risk to the Edwards Aquifer. Page 4-31 of the EIS supports this conclusion. The EIS explains that the applicant's proposed route crosses 6.4 miles of the recharge zone of the Edwards Balcone Fault Zone Aquifer. Significant impacts to groundwater in this highly sensitive area could occur in the event of oil spills or leaks during pipeline operation. The pipeline would also cross approximately 20 miles of the Onion Creek watershed upstream from the recharge zone. A spill in this area could be transported to the fractured limestone recharge zone by flow in Onion Creek and under a worst-case senario, reach the Edwards "sole source" aquifer.

110-3 We disagree with your statement on page 5-3 of the EIS that no one route is significantly better. Although all the routes would cross a number of aquifer's, as would be expected by any pipeline project, only the applicant's proposed route crosses a recharge zone of a designated "sole source" aquifer. In view of the potential risk of contamination

RESPONSE TO LETTER 110

110-2 Your comment regarding support for the Northern Alternative due to avoidance of impacts to the Edwards Aquifer is noted.

110-3 Your comment regarding opposition to the Proposed Route because of potential contamination of a sole-source aquifer is noted. Please refer to Response to Comment 12-3.

LETTER 110

-4-

110-3 Cont. due to operational oil spills, we view utilization of the applicant's route inadvisable. Other alternatives have been identified and are available which would avoid both direct and indirect impacts to the "sole source" Edwards Aquifer and Recharge Zone.

110-4 The Southern route offers construction and engineering design problems which make feasible implementation highly questionable. Additionally, portions of this alignment are so remote that spill response time would be lengthy.

110-5 In conclusion, we therefore find that BLM's preferred alternative, the Northern Route, for the construction and operation of the All American Pipeline to be the best choice from an operational and environmental standpoint since it will significantly minimize potential adverse impacts affecting human health and welfare. We support BLM in its decision to select the Northern Route and believe the EIS adequately evaluates all the alternatives.

We classify your Draft Supplemental EIS as Lack of Objections (LO). Specifically we have no objection to the implementation of BLM's preferred alignment, the Northern Route, with the proposed mitigation measures as described.

Our classification will be published in the Federal Register according to our responsbility to inform the public of our views on the proposed Federal actions, under Section 309 of the Clean Air Act.

We appreciate the opportunity to review the Draft Supplement. Please send our office one copy of the Final EIS at the same time it is sent to the Office of Federal Activities, U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460.

Sincerely yours,

Robert E. Layton Jr., P.E.
Regional Administrator

RESPONSE TO LETTER 110

110-4 Your comment regarding problems with the Southern Alternative is noted.

110-5 Your comment regarding support for the Northern Alternative, with proposed mitigation measures, in order to minimize potential adverse impacts to human health and welfare is noted. Your "lack of objection (LO)" classification is appreciated.

LETTER 111

Route 1, Box 18-B1
Cat Spring, Texas 78933
April 10, 1987

Mr. William Haigh
U.S. Bureau of Land Management
1695 Spruce
Riverside, California 92507

RE: "All-American Pipeline"
Proposed Northern Route

Dear Mr. Haigh:

Thank you for the courtesy extended me by allowing me time to receive and review the Environmental Impact Statement.

111-1 I am enclosing herewith several photographs of landmarks in the Cat Spring area. These are labelled on the reverse side for your information. As I have stated before, the Cat Spring Spring, the point of our heritage and beginning, runs just north of the Cat Spring Agricultural Society Hall and grounds. The Texas marker stands on these grounds. The Agricultural Society is the oldest such establishment in the State of Texas. Minutes of the early meetings have been compiled and have been published in a historical book. Established in 1856, the Society still is active in the German heritage of our community and the well-being of the agricultural needs of our community.

The proposed heater-pump station is projected for the area immediately near or at the site of the beginning of the Cat Spring spring. (Photo enclosed.) The remains of the old Kellner homestead are there at this settlement site. (Photo enclosed.) Please note the mud between the walls.

It is my understanding that the heater-pump station can be located elsewhere along the route, that it need not be located in this exact location. May I propose that if it is indeed required, that it be moved farther southeast, towards the lower Sealy/Wallis area?

111-2 To destroy 200± year old live oaks, the natural foliage in and around the Cat Spring creek would be sinful. No amount of Tax Income to the County is worth that. The beauty of Cat Spring is our natural surroundings, our wildlife, native flowers, wooden acreage and serene rolling hills.

This past weekend I drove Highway 36 South to Rosenberg, via Sealy, Wallis, Orcherd and Rosenberg...why can't the heater-pump station be located in the vast flat open miles of land in that portion of Austin County or Ft. Bend Counties, where no trees or natural water sources need be destroyed, thereby saving a Texas historical settlement?

RESPONSE TO LETTER 111

111-1 The pump/heater station will be located such that the quality of the Cat Springs area is not compromised. The stations can be moved within reason and still comply with engineering specifications. Please refer to Mitigation Measure SS-9 in Appendix A.

111-2 Your comment concerning Cat Spring Creek is noted. This Blackland Prairie/Post Oak Savannah region is dominated by post oak communities and agricultural land. Live oaks are commonly associated with the post oak communities. However, the location of the proposed pump/heater station will be based on arrangements made between the AAPL and the private landowner(s) involved at this site.

LETTER 111

I am 37 years old. My sister and I own land in Cat Spring which has been in our family since the days of the settlement of Cat Spring. We are descendants of the pioneer Dittert family. Our livestock depend on the flowing water source of the Cat Spring creek, which runs through our property. The spring has supplied our family water for over 150 years.

The Environmental Impact Statement discusses the noise factor this heater-pump station will create. Your proposed site is near the Agricultural Society Hall, parkgrounds and local residences. This is a concern of mine.

111-3 The proposed route of the pipeline will run very near the Schlapota/Batla cemetery. Franz Schlapota was born December 25, 1825 in Bohemia and settled in the Cat Spring area before 1850. This is a concern of mine.

Texas historians will tell you that Cat Spring is the Second Oldest Establishment in the State of Texas. When Stephen F. Austin settled on the banks of the Brazos River in what is now San Felipe, several of his German pioneer settlers, lead by Lieut. Ludwig vonRoeder and his family went one day's journey farther northwest. This was 1832. They camped that night at a spring, where a wild cat jumped over the creek. The vonRoeder family named this settlement "Katzenquelle" and so we were settled...Cat Spring. (edited from The Cat Spring Story, copyright 1956, by the Cat Spring Agricultural Society.)

2-532

In closing, I quote from an article which appeared in the March 25, 1987 issue of the BRENHAM BANNER PRESS, page 2, with headline "Pipeline to Start Pumping Oil from California," with by-line from Staff and Wire Reports....'Louis J.
111-4 Resweber, Director of Communications for All-American said the California to McCamey pipeline can function without the final leg. All American already has contracts with existing pipelines to move oil from McCamey to Texas Gulf Coast Refineries, Borger and Cushing, Oklahoma."

I ask, "why then the destruction of Texas History, landmarks, water sources and century-old trees and landscaping? Why??"

Thank you for this opportunity to speak up for the preservation of our historical community.

Very truly yours,

Margaret Kollatschny Stolz

Margaret Kollatschny Stolz,
Landowner, Taxpayer
Cat Spring, Austin County, Texas

/mks
enclosures

RESPONSE TO LETTER 111

111-3 Please see the response to Comment 111-1. Your comment regarding the historic features of Cat Springs is noted. The archaeological surveys will be in compliance with Section 106 of the National Historic Preservation Act through the Memorandum of Agreement signed by the BLM, the Texas Historical Commission, and the Advisory Council on Historic Preservation. Please see Mitigation Measure CR-1 in Appendix A.

111-4 Heavy California crude must be diluted to allow shipping through existing lines without being heated. However, none of the existing network lines are heated. Please refer to the Modifications and Corrections section for pages 2-37 and 4-172 for more information on the No Project Alternative.

LETTER 112

COMMISSIONERS

EDWIN L. COX, JR.
Chairman, Athens

RICHARD R. MORRISON, III
Vice-Chairman
Clear Lake City

BOB ARMSTRONG
Austin

GEORGE R. BOLIN
Houston

WM. O. BRAECKLEIN
Dallas

WM. L. GRAHAM
Amarillo

A.R. (TONY) SANCHEZ, JR.
Laredo

DR. RAY E. SANTOS
Lubbock

WILLIAM M. WHELESS, III
Houston

TEXAS
PARKS AND WILDLIFE DEPARTMENT
4200 Smith School Road Austin, Texas 78744

CHARLES D. TRAVIS
Executive Director

April 13, 1987

Mr. William S. Haigh
U. S. Department of the Interior
Bureau of Land Management
California Desert District
1695 Spruce Street
Riverside, California 92507

Re: Draft Environmental Impact Statement (DEIS)
for the All American Pipeline Project

Dear Mr. Haigh:

112-1 During the past few months this agency has coordinated with your staff or your consultant, ERT, as a cooperating agency on the All American Pipeline Project. A significant amount of agency information has been provided concerning fish, wildlife, and recreation resources. A review of the document reveals that a considerable amount of this information has been included in the DEIS. The document provides a detailed discussion of fish and wildlife resources, and identifies adequate mitigation measures that will be implemented to ameliorate adverse project impacts.

112-2 After reviewing the potential adverse effects of construction activities and oil spills upon aquatic resources, surface water, estuarine areas, and aquifers, this agency finds the "northern alternative" preferable. While this route is the longest, and therefore would impact more acres of terrestrial habitat during construction, the potential adverse effects of the other two routes outweigh the short-term construction impacts.

112-3 The Department endorses the mitigation measures found in Section 4.7 (pages 4-174 through 4-211). To ensure that the pipeline is monitored during construction and operation, this agency supports the designation of an Authorized Officer (pg. 1-5) to monitor the Construction and Use plan. This person should also perform follow-up assessments to ensure that all wildlife reclamation and other mitigation measures are successful.

RESPONSE TO LETTER 112

112-1 Your comment regarding adequacy of the data analysis and implementation measures is noted.

112-2 Your comment regarding support for the Northern Alternative is noted.

112-3 Your comment regarding mitigation measures and an Authorized Officer is noted. Please refer to the response to Comment 6-15.

LETTER 112

Mr. William S. Haigh
Page Two

Because the Biological Assessment on this project was not received until March 3, 1987, this agency will provide comments on this document at a later date. Regarding the Section 7 consultation process that is currently being performed by the United States Fish and Wildlife Service to evaluate the effect of this project upon endangered species, this agency agrees that this process should be completed prior to preparation of the final EIS. Additional comments provided in my earlier December 12, 1987 letter should also be considered in preparation of the final EIS. Additional comments on specific sections of the DEIS are shown on the attached sheets.

I appreciate the opportunity to provide comments on this project.

Sincerely,

Charles D. Travis
Executive Director

CDT:RS:km

cc: Dale Hall, U.S. Fish and Wildlife Service, Houston
William J. Sheffield, Attorney General's Office, Austin

RESPONSE TO LETTER 112

LETTER 112

COMMENTS ON SPECIFIC SECTIONS OF THE DOCUMENT

112-4 1. Page 1-5, paragraphs 3 and 4 - This agency supports the proposal to designate an Authorized Officer to oversee compliance with the Construction and Use plan. This would also insure that required mitigation features, as set forth in the settlement agreement (Civil Action Number A-86-CA-141) and the Record of Decision, are closely followed.

112-5 2. Page 2-7, paragraph 3 - Installation of remote-control block valves at all pump stations and at aquifer crossings is warranted. However, these valves are also needed at all major river crossings. As stated on page 5-4, paragraph 2, "Mitigated with remote-control valves at each crossing, the severity of the impacts would be greatly reduced." For this reason, to mitigate the extent of the effects of any spill on aquatic resources, installation of remote-control valves at all major river crossings is needed. This should be a required mitigation feature of the selected route.

3. Page 2-8, Table 2-4 - For the reason stated in the previous comment, block valves on the South Llano, Colorado, San Bernard, Brazos and both Pedernales River crossings should be upgraded to remote-control valves. This recommendation also applies to all major river crossings on all alternate pipeline rights-of-way.

112-6 4. Page 2-20, paragraph 3 - Concerning the disposal of cleared vegetation, burning the material is preferred. As an added mitigation feature, leaving 5 or 6 small brushpiles (6 to 7 feet long by 3 feet wide) per mile along the right-of-way would provide cover for small mammals. This would also provide a prey food source for raptor species.

112-7 5. Page 2-20, paragraph 5 - Concerning the possible use of explosives in water, Section 66.003 of the Parks and Wildlife Code prohibits the use of explosives in water unless the work is for construction purposes and is authorized in writing by a county judge where the work would be performed. Section 86.002 also requires a sand, shell, gravel and marl permit when state-owned streambeds are disturbed. Additional information concerning the permit is available from this Department.

112-8 6. Page 2-25, paragraph 2 - This agency recommends the use of native plant species for reclamation activities.

112-9 7. Page 2-32, paragraph 5 - Aerial surveys of the line which pass near developing and/or sensitive areas should be conducted on at least a weekly basis, rather than every two weeks as proposed. This would be particularly appropriate for major river crossings.

112-10 8. Page 2-35 - Concerning the proposed location of pump heater stations, the selection of sites that are open pastures or areas where the habitat has previously been disturbed is preferred. Locating the stations a considerable distance from permanent streams is also recommended.

Spain-Haig-03/25/87

RESPONSE TO LETTER 112

112-4 Your comment regarding compliance with the Construction and Use Plan is noted.

112-5 Remote-control block valves were recommended for river crossings where significant impacts might occur. Mitigation Measure SS-2 in Appendix A and Table 4-62 in the Modifications and Corrections Section 3.2 lists these crossings and the rationale for valve placement. All pump stations have remote-control block valves.

112-6 Your comment is noted. Vegetation disposal may be accomplished through burning, burying, or the establishment of brush piles. For the most part, the details of brush disposal will be decided in conjunction with the wishes of the landowner. We support your suggestion for brush pile establishment where appropriate (i.e., away from potential areas of oak wilt contamination) and where agreeable to the landowner.

112-7 The comment concerning the possible use of explosives and necessary permits required is noted. AAPL will follow the necessary procedures and will obtain all necessary permits for use of explosives and streambed disturbance. Please review Mitigation Measure AB-4 in Appendix A for protection of aquatic resources.

112-8 Your comment is noted. The reclamation seed mixture for each area along the ROW will be decided by the Authorized Officer in conjunction with input from the Soil Conservation Service Revegetation Specialist and the landowner. Where appropriate, the use of native plant species is preferred. Please see response to Comment 56-24.

112-9 The frequency of aerial reconnaissance surveys proposed by AAPL meets the DOT requirements specified in 49 CFR Part 195.

112-10 Your comment regarding the location of pump/heater stations in relation to permanent streams and undisturbed areas has been reviewed. The location of pump/heater stations in relation to streams and undisturbed areas will be evaluated and positioned at a distance to protect these areas if possible.

LETTER 112

112-11 9. Page 3-42 - Live oak-ashe juniper parks and live oak-ashe juniper woods occur along the Balcones Fault line and in the vicinity of the pipeline crossing in Hays County. These types should be mentioned in this section. The woods type comprises nesting habitat for the threatened golden-cheeked warbler.

112-12 10. Page 3-58, Table 3-14 - Black-capped vireo habitat occurs near the pipeline crossing and in Hays County. This should be included under "sensitive area."

112-13 11. Page 3-203, paragraph 1 - Because exotic animals are not abundant in the Post Oak Savannah, the decline of white-tailed deer should not be attributed to habitat lost from exotic ungulate propagation.

112-14 12. Page 4-63, paragraph 4 - This agency supports the concept of requiring a time window for any construction within 2 miles of a known bald eagle nest site. Since bald eagle courting pairs may be found in the nesting area beginning in October, and would have young in the nest as late as May 15, any proposed construction should be avoided from October 15 to May 15. Since a specified length of time during which the nests should be avoided depends upon when the eggs are layed, any activity near nests should therefore be coordinated with this Department.

112-15 13. Page 4-75, Table 4-20 - Previous statements in this document reveal that the crude oil will have a high sulphur content. Since hydrogen sulfide is an extremely toxic gas that is odorless in high concentrations and is a fugitive emission of high sulphur crude oil, this table should also list this gas. This section should discuss any preventative measures or monitoring that is planned to identify hydrogen sulfide emission sources and concentrations of the gas leaked.

112-16 14. Page 4-27, paragraph 2 - The four Texas Natural Heritage Program (prairie) grassland climax communities (bluestem-Indiangrass) within or adjacent to the pipeline right-of-way of the northern route should be avoided by realignment.

112-17 15. Page 4-157, paragraph 4 - As stated, the "southern alternative" would impact 260 acres of riparian habitat. The impact of the "northern alternative" would be reduced to 120 acres.

112-18 16. Page 4-159, paragraph 4 - Realignment or construction timing constraints are recommended when activities are planned near active bald eagle nests.

112-19 17. Page 4-175, measure 55-2 - The use of remote-control block valves will certainly reduce the volume of oil spilled. As previously stated, this agency favors the use of these valves on all major river crossings. While it is understood that upgrading existing block valves to be remote-controlled would cost $25,000, this is only a small cost when compared to the cost of a large spill cleanup.

Spain-Haig-03/25/87

RESPONSE TO LETTER 112

112-11 Your comment regarding this issue is noted; please refer to the Modifications and Corrections section for page 3-42 regarding live oak/Ashe juniper parks and woods.

112-12 According to information provided in the Biological Assessment,the black-capped vireo is not known to occur in Hays County. Please see the Biological Assessment for more detail on occurrence and potential habitat for this species.

112-13 Based on your comment, please refer to the Modifications and Corrections section for page 3-203.

112-14 As outlined in the Draft SEIS, Biological Assessment, and subsequent correspondence, the construction avoidance periods and coordination requests of your agency as well as the results of consultation with the USFWS will be adhered to for all active bald eagle nests. Please review Mitigation Measure TB-8 in Appendix A for the bald eagle.

112-15 Please refer to the Modifications and Corrections section for page 4-4 for additional details on the prevention of hydrogen sulfide from shipment within the pipe.

112-16 Your comment regarding avoidance of classified climax grassland communities is noted and avoidance of these areas is specified in Mitigation Measures TB-1 and TB-12 in Appendix A.

112-17 Your comment regarding the comparison of riparian impacts is noted.

112-18 Your comment regarding construction timing constraints for active bald eagle nests is noted; please refer to the response to Comment 112-14.

112-19 Please refer to the response to Comment 112-5.

LETTER 112

112-20 18. Page 4-183, measure TB-1 - This agency supports the measure to reduce riparian crossings rights-of-way to 50 feet.

112-21 19. Page 4-187, measure TB-12 - Concerning mitigation of individual threatened/endangered species, animals can conceivably be relocated, although this is not recommended. However, if plants are located in the right-of-way, "... other mitigation measures will be developed." What are the "other" measures? These measures should be stated. Realignment or right-of-way reduction should be used when any endangered plants would be disturbed.

112-22 20. Page 4-188, measure TB-14 - This agency agrees with realignment or right-of-way reduction as a mitigative feature. Transplanting endangered species should not be attempted because of the uncertainty associated with identifying nutritional and physical requirements of living organisms.

112-23 21. Page 4-188, measure TB-15 - This measure is an excellent mitigation feature. Strict adherence to compensation by planting lost riparian species is recommended. Sites for replanting should be carefully chosen and areas checked for compliance.

APPENDICES

112-24 1. Page B-15, paragraph 4 and 5 - Having a single number to call for reporting oil spills is a logical approach. However, using a toll-free number in Pennsylvania (1-800-245-4545) may not be the best method for providing information to local agencies for spills occurring in the state.

RESPONSE TO LETTER 112

112-20 There have been varying opinions as to the feasibility and supportability of the reduced ROW of riparian crossings (see, for example, Comment 95-18). We have modified Mitigation Measure TB-1 (in Appendix A) to reflect these considerations while still providing appropriate mitigation or compensation.

112-21 Your comment regarding this issue is noted. Please refer to revised Mitigation Measure TB-12 in Appendix A.

112-22 Your comment regarding endangered species transplanting is noted. We agree that transplating endangered species should not be attempted in most cases; however, in some situations, transplanting may be the most appropriate mitigation measure to be implemented.

112-23 Mitigation Measure TB-15, including compensation, has been combined into a revised Mitigation Measure TB-1 in Appendix A.

112-24 AAPL is presently deciding which system to use, such as the Texas One-call System. The important consideration is not where the telephone call originates, but whether the call receives proper emergency response action. Please refer to Comment 18-3.

LETTER 113

WRAY & TODD INTERESTS, LTD.

William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

16 April 1987

Dear Mr. Haigh,

113-1 We would like to register our strong opposition to the proposed All America Pipeline. The pipeline appears to be unjustified in economic terms, damaging environmentally, and unfair legally.

Our family owns land in Colorado County near Borden, Texas, along the proposed route of the pipeline. We have been approached about granting right-of-way to the pipeline, have rejected initial offers, and were eventually included in condemnation proceedings.

Economically, the cost of transporting the oil seems extremely difficult to support at current or prospective oil prices. Furthermore, oil production from the North Slope has begun to decline this year and should limit future supplies to the pipeline.

113-2 From an environmental standpoint, the pipeline seems to be ill-conceived. Its route crosses and endangers the recharge zone for the Edwards aquifer. Recent studies at Rice University indicate that groundwater from the aquifer has high nitrate levels associated with septic tank drainage near the land surface. This might be taken as a warning for the effects of a leak from the pipeline.

113-3 From a legal standpoint, the pipeline is not fair. Legally, the EPA has been careless in allowing such large differences in air standards among the states that would make it profitable to construct a 1900-mile pipeline to take advantage of these differences. If this is the chief purpose of the pipeline, it seems that Goodyear abuses the right of eminent domain, a privelege for advancing the public welfare (including public health and air quality).

Thank you for the opportunity to comment on this project. Please include and respond to this letter in the EIS.

Sincerely, Bruce Todd

1724-A SUNSET BLVD. • HOUSTON, TX 77005-1739 • 713-529-2229

RESPONSE TO LETTER 113

113-1 Your comment regarding opposition to the Proposed Route is noted. You are correct that future oil prices and North Slope production will influence the future supplies of crude to the pipeline; please refer to Comment 56-1 for a discussion of supply and demand.

113-2 Your comment regarding possible septic tank pollution of the Edwards Aquifer is noted. We are aware of this problem. Thank you for commenting.

113-3 Your comment regarding air quality standards is noted. The same standards apply to Texas and California, however, California has difficulty meeting those standards for a variety of reasons. Refer to Comment 6-1.

LETTER 114

April 23, 1987
1302 Shatter
San Angelo, Texas 76901

Mr. William Haigh
Bureau of Land Management
1695 Spruce St.
Riverside, CA 92507

Mr. Lanny Reid
ERT Project Manager
1716 Heath Pkwy.
Ft. Collins, CO 80524

Gentlemen:

Pursuant to our correspondence of April 8, enclosed is the written testimony of several expert consultants to the Tom Green County ad hoc group, on the proposed All-American Pipeline draft Environmental Impact Study. The group is very grateful for the additional time we received to elicit the testimony; the level of education and information among the public of San Angelo and Tom Green County is now very much greater, thanks to the effort that produced the enclosures.

Letters are enclosed from Mary Jean Aiken, San Angelo geologist; Darrell Creel and Jules Jaquier, archeologists; Lewis Runion, San Angelo geologist; Richard Funk, San Angelo mayoral candidate; and Ralph Hoelscher, landowner and former candidate for the Texas Railroad Commission. Under separate cover you should receive letters from Andrew L. Williams, consulting engineer and ground water specialist, and Delbert Caffey, retired from the U.S. Army Corps of Engineers and former San Angelo mayoral condidate.

Also enclosed is a cover letter dated April 21, 1987, signed by nine members of the ad hoc group, outlining a summary of our conclusions for applying the study to our area.

114-1 Our group read the fine testimony of Brandt Mannchen, Sierra Club Water Resources Chairman, originally delivered at the Brenham hearing, and we wish to second it. His cover letter is enclosed for your convenient review. Our mutual concern with the Sierra Club is the Concho river snake, an endangered species, and we cannot improve on Mr. Mannchen's testimony. Although we disagree with a sentence here and there, we find a great deal of merit in Mr. Mannchen's lengthy critique of the draft EIS, particularly in his discussion of petrochemical contamination of water. Recent articles from the San Angelo Standard Times on the Stacy dam construction are enclosed; I repeat our contention that the Stacy dam area, of deep concern to both the Sierra Club and local residents, be designated 'sensitive' and given its own "worst case scenario."

RESPONSE TO LETTER 114

114-1 Your comment to protect your resources in the San Angelo area in Tom Green County is noted. Relative to Stacy Dam and Reservoir, the route was realigned to 3 miles below the dam itself to avoid crossing the proposed pool area for the future Stacy Lake. For discussion of potential impacts on the Concho water snake, please refer to the response to Comment 56-6 and Mitigation Measure TB-9 in Appendix A.

LETTER 114

114-2 Several of the group have concluded that further study of the Stacy area and the Concho Valley watershed may well dictate that the pipeline be moved out of the populous Tom Green County and its elaborate, far-flung watershed altogether. We do not discuss this at length in this communication because we do not understand whether major changes in the proposed route are now up for consideration under the BLM's ground rules for review of the EIS. What are the proper channels for proposing such a major change in the northern route, for instance running the line through Coke and Sterling Counties, the under-populated areas well to our north and north of the Edwards aquifer? The enclosed newsclips state that concern for the Stacy area has blocked construction of that dam for the past ten years, and that more suits and stays may be pending. The Celeron company should consider the possibility that the same concerns could very well block pipeline construction in the same area for the same lengthy delay.

Our expert consultants may submit technical contributions to the final study in May. They now have the advantage of knowing both the draft EIS and local conditions, and our ad hoc group strongly encourages ERT to discuss the study with them. We are all at your disposal to help you find answers to questions about the Tom Green County area.

Thank you for your additional consideration.

Sincerely,

Ruth G. McGill, MD

Ruth G. McGill, M.D.

Enc.

RESPONSE TO LETTER 114

114-2 We have considered your comments and others for the San Angelo area relative to moving the line further north or along other alignment; however, evaluating the currently proposed Northern Alternative, we have found the impacts are either not significant or can be mitigated to acceptable levels. However, any letters submitted to BLM prior to the final decision will be considered by the Bureau. That final decision cannot be made earlier than 30 days after the release of this Final SEIS.

WILDLIFE CONSERVATION

SIERRA CLUB — LONE STAR CHAPTER

March 18, 1987

William Haigh
Federal Project Manager
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Dear Bill,

Enclosed are the comments of the Lone Star Chapter of the Sierra Club concerning the Draft Environmental Impact Statement (DEIS) for the All American Pipeline project. As we have indicated in the past we question the need for this project as proposed. We will outline our major concerns and then follow these with our specific, page by page, comments.

Major Concerns

1) The need for this project seems to be in question. Recent articles in the press (copies enclosed) indicate that Celeron has not even signed on any customers for use of this pipeline. According to industry sources this is a very unusual circumstance. In addition due to a variety of market conditions, including low prices, expense of extracting heavy crude oil, and environmental concerns, California OCS production is far below predicted extracted volume. Industry analysts say that prices will have to rise to $25/barrel before significant drilling recovery occurs. Due to all of these uncertainties we question the economics and need that this pipeline was projected to fulfill. In addition there seems to be indications that use of California heavy crude will displace some Texas crude. A new evaluation of economic trends in the oil indistry and how these relate to building of this pipeline needs to be done for the FEIS. Such an analysis needs to include impacts on use of Texas crude as far as its displacement by California crude goes. Finally, Robert Cercer, Goodyear's chief executive, was quoted last year as saying the pipeline only needs to carry 100,000 barrels/day to break even. The question then is: Why build it so big? Surely a project of this magnitude cannot have 2/3's of its capacity remain idle and expect to turn a profit. This does not make economic or efficiency sense.

2) The BLM is presently in violation of the National Environmental Policy Act and the Council on Environmental Quality's regulations because it has allowed the piecemeal construction of this pipeline before an adequate EIS has been filed on the entire project. CEQ is quite specific concerning this, "Until an agency issues a record of decision ... no action concerning the proposal shall be taken which would: (2) limit the choice of reasonable alternatives.". CEQ regulations also state, "Agencies shall not commit resources prejudicing selection of alternatives before making a final decision". Finally CEQ says, "Proposals or parts of proposals which are related to each

other closely enough to be, in effect, a single course of action shall be evaluated in a single impact statement.". The McCamey-Webster leg was part of the original EIS and is only a section of the entire project. Therefore this DEIS should have been completed before any construction on the pipeline began. Your actions prejudice the entire decision and are illegal.

3) Because of the aforementioned bias the true no action alternative has been rendered meaningless in this document. The supposed no action alte native in this DEIS is in fact not a no action alternative since it would allow oil to go through the part of All American Pipeline already illegally built and then through an existing network of pipelines to the refineries on the Gulf Coast. No action means just that, no deviation from before project conditions. Before project conditions, in this instance, means that there is no All American Pipeline in existance.

4) The supposed no action alternative used in this DEIS, the use of existing pipelines to get crude to the coast, has not been equivalently analyzed versus the proposed segment alternatives and a true no action alternative. As CEQ regulations state, "Devote substantial tretment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.". In addition you have also given inadequate development to the retrofitting of refineries in California, which according to figures you have gathered, may redice substantially or eliminate the need for this pipeline. Finally, as we stated in our comments concerning the previous Draft and Final EIS's on this project, all reasonable alternatives must be looked at. This would include an energy conservation alternative.

5) This DEIS gives preferential treatment in the form of additional mitigation to the Edwards Aquifer. It is the Sierra Club feeling that all important aquifers are equally valuable and must be equally protected. Therefore the smae protective features, specially provided for the Edwards Aquifer must also be provided for all other aquifers.

6) Stream protection is given short shrift in this DEIS. Open dredging of stream bottoms is allowed, not all streams have automated valves or valves at all, and there is no directional drilling of the pipeline for stream crossings. We feel the significance of streams has bee artibrarily defined sto that money can be saved in construction costs. When it comes to spending money versus contaminated surface or groundwater sources the Sierra Club supports spending the money. This DEIS does not advocate this policy. Old data is used for oil spill analysis, mealth effects are ignored or stated in a way to try and minimize their impacts, and freshwater lakes used for drinking water, like Twin Buttes, are not fully protected against oil spills.

7) The DEIS also minimizes the impacts that will occur to the Concho Water Snake and other listed species. With the Stacy Dam, this pipeline and other modifications of stream and water quality will result in almost certain extinction of the CWS. The pipeline should be directionally drilled under the Colorado River so it will not disturb riparian and CWS habitat. The Black-Capped Vireo has been proposed for listing as endangered. The Attwaters Prairie Chicken will be adversely impacted by the pipeline. Definite mitigation of habitat including purchase and maintenance of habitat must be required for all endangered species impacts.

8) The oil spill risks are far too high from this project. BLM has arbitrarily used a less meaningful data base to determine oil spill hazards and then has minimized risks by saying they will be low or damage can be sufficiently cleaned up. The response times of two or more hours are much too great for a pipeline this size, especially since manual valves will be used at many locations. Several more pipeline stations where

personnel and equipment are locate and within one hour from any part of the pipeline are needed. A worst case spill is not modeled since the 20 miles of insulated line after each heating station are not used in the spill scenario.

9) There is absolutenly no analysis of pipeline accidents at the oil terminal where this oil pipleitne will end in Texas City or of tanker accidents from this terminal.

10) The air quality analysis is atrocious. The worst pollutant problem on the Gulf Coast, ozone, is not even discussed. Yet with additional NOx's and HC's, there will be more ozone formed. The Houston area is nonattainment for ozone but this fact is never mentioned and analyzed. Also greater amounts of heavy metals, TSP, and toxic organic compounds will be emitted by the pipeline and or the refineries that use this heavy crude but these pollutants either are not discussed or are summarily passed over. Why should Texans have to breath dirtier air because California does not want air pollution producing refineries or does not want to spend the money to put controls on its existing refineries? Our lungs are just as sensitive to airborne sickness and disease and we want equal consideration for our health. Primary and secondary air pollution is one of the prime impacts of this pipeline and must be addressed.

11) Noise and visual impacts have been low-rated and arbitrarily given good mitigation marks when in fact their effects will be significant. Complete mitigation is required.

As a result the Lone Star Chapter of the Sierra Club requests that BLM revise this EIS and release it as a supplemental draft document so that reviewers can have the opportunity of commenting on the adequacey of the major issues we have mentioned above that must be revised. The following pages will contain our specific, page by page, comments on this DEIS.

Sincerely,

Brandt Mannchen

Brandt Mannchen
Chair, Water Resources Committee
Lone Star Chapter of the Sierra Club
1515 Missouri #17
Houston, Texas 77006
H713-522-1489, W713-645-5316

Wednesday April 8, 1987

SOUPS
Recipes for tortilla navy bean and spiced meatball soup — 1B

CROP LOSS
Cold weather leaves WT wheat crop in shambles — 1C

CONTROVERSY
Hagler-Leonard decision stirs arguments — 1D

36 pages

San Angelo
Standard Times

Stacy Dam permit is expected today

By PHILLIP SWANN
Harte-Hanks Washington Bureau

WASHINGTON — The U.S. Army Corps of Engineers will announce today that it will grant a permit for construction of Stacy Dam, according to Sen. Phil Gramm.

Gramm, R-Texas, said Tuesday he was informed of the decision by corps officials.

"Winning final approval has required a long, hard fight . . . I'm pleased to be able to say the persistence of leaders throughout West Texas has paid off," Gramm said.

The move seems to clear the way for the Colorado River Municipal Water District to begin work on the dam, which would meet the water needs of Abilene, San Angelo and much of West Texas through the year 2010.

But Eric Jorgenson, an attorney for the Sierra Club Legal Defense Fund in Washington, said several conservation groups are considering legal action to block construction.

Jorgenson said the groups, which are seeking to protect the Concho water snake, are expected to decide whether to file suit during the next week.

The snake's habitat includes areas targeted for Stacy Dam, and Fish and Wildlife Service officials once expressed concern that the reservoir could pose a danger.

Thursday April 23, 1987

WINNER
General Telephone Company employee named Secretary of Year — 8A

MUSIC STAR
Ricky Skaggs pauses in San Angelo to discuss his upcoming dance tour — 12A

TRACKSTER
NCAA II sprint leader preparing for LSC meet — 1B

28 pages

San Angelo
Standard Times

Stacy Dam construction to begin May 4

By REX HENDERSON
Staff Writer

Construction of Stacy Dam, the West Texas water impoundment that took a decade to push through state and federal regulation, will begin May 4. A formal ground breaking is planned for May 16, the dam's primary sponsor said Wednesday.

The Colorado River Municipal Water District, the managing partner in Stacy, Tuesday signed a contract with Brown & Root Inc., low bidders on dam construction at $30.7 million.

CRMWD General Manager Owen Ivie said a work order issued with the contract requires Brown & Root to start counting construction days on May 1. The Houston contractor promised to complete the dam in 900 calendar days. That means the expected completion date, assuming no delays, is Oct. 16, 1989.

Stacy will provide water to CRMWD cities of Odessa, Big Spring and Snyder, as well as partner cities of Abilene, Midland and San Angelo.

The CRMWD already has purchased 7,000 acres at the Stacy site, including all of the land for the dam at the confluence of the Concho and Colorado rivers 45 miles east of San Angelo. The district is still buying land in the reservoir basin.

Ivie said the contract was signed Tuesday following a meeting of the Colorado River Municipal Water District, Brown & Root, and the consulting engineers, Freeze & Nichols.

Ivie said a Brown & Root representative indicated that the company would begin moving in equipment and mobile buildings to its headquarters and the dam site next week, and will begin clearing the land May 4.

A formal ground breaking ceremony will be held May 16, and will include a luncheon with state and federal dignitaries.

U.S. Sens. Lloyd Bentsen and Phil Gramm of Texas have been invited. Gramm's office has indicated he would attend, while Bentsen's attendance remains uncertain.

U.S. Rep. Charles Stenholm, D-Stamford, will attend the ceremony. U.S. Rep. Larry Combest, R-Lubbock, has said he cannot attend because of a conflict. U.S. Rep. Lamar Smith, R-San Antonio, who represents San Angelo, has not yet responded.

State senators representing cities participating in Stacy have been invited. Bill Simms, D-San Angelo; Grant Jones, D-Abilene; and John Montford, D-Lubbock have indicated they will attend, as have the state representatives Dick Burnett, D-San Angelo; Larry Don Shaw, D-Big Spring; Gerald Geistweidt, R-Mason; Steven Carriker, D-Roby; Bob Hunter, R-Abilene; Jim D. Rudd, D-Brownfield; and Gary Watkins, D-Odessa.

Gov. Bill Clements, former Gov. Mark White, Lt. Gov. Bill Hobby and Texas Speaker Gib Lewis have been invited.

LETTER 115

Darrell Creel
203 Suffolk
College Station, Texas 77840

18 April 1987

Mr. William Haigh
US Bureau of Land Management
1695 Spruce Street
Riverside, California

Dear Mr. Haigh:

In response to an inquiry about archaeological research I have conducted in southern Tom Green County, none of the areas I have examined appear to be crossed by the proposed right-of-way for All-American pipeline. However, I have conducted archaeological investigations in several areas very near the proposed right-of-way. Most of my work has been archaeological survey, and I have intensively examined several thousand acres in the Christoval area of southern Tom Green County. These survey efforts have been reported in my Masters Thesis and Doctoral Dissertation.

115-1 Based on my work and the investigations of others in the vicinity, I can confidently predict the occurrence of significant archaeological and possibly historical sites in the actual (proposed) right-of-way. Many of these sites will probably of such significance as to be eligible for inclusion on the National Register of Historic Places. Given this probability, it is imperative that an intensive program of archaeological survey be conducted of the entire right-of-way if this is the route chosen for the All-American Pipeline. Such a survey should locate and evaluate all historical and archaeological sites in the right-of-way; this will provide preliminary information on which to base decisions that will lead to preservation of the significant sites (such as shifting the right-of-way alignment) or to mitigation of adverse impacts, perhaps through excavations.

If I can be of further assistance in this matter, please do not hesitate to contact me.

Sincerely,

Darrell Creel

Darrell Creel, PhD.

RESPONSE TO LETTER 115

115-1 Your comment regarding this issue is noted. Specific requirements for inventory, evaluation, and treatment of cultural resources along the selected alternative are included in the mitigation measures in Appendix A of the Final SEIS and in the Programmetric Memorandum of Agreement and Memorandum of Agreement documents as referenced in that section.

LETTER 116

April 20, 1987

Mr. William Haigh
BLM Project Manager
1695 Spruce St.
Riverside, CA 92507

Dear Mr. Haigh:

I want to thank you for giving me the opportunity to make additional comments to the Environmental Impact Statement which you are preparing for the All American Pipeline Company concerning the 30-inch pipeline construction project from McCamey to Texas City. I am most concerned about the northern route.

116-1 1. The EIS does not mention the Stacy Lake sensitive area in Concho County. This 554,000 acre foot reservoir is scheduled to be built with construction to begin in May 1987. Hydrocarbon leakage into the Stacy Reservoir would affect over 500,000 residents in the cities of San Angelo, Big Spring, Midland, Odessa, Abilene, and other smaller towns which will be dependent on this water supply.

116-2 2. Hydrocarbon leakage into the Twin-Buttes and Nashworthy pubbic water supply reservoirs would also affect the 80,000 plus residents of San Angelo.

116-3 3. Hydrocarbon leakage into groundwater aquifers of the Leona, Bullwagon, and other minor fresh water formations in Tom Green County would affect the livelihood of over 100,000 Tom Green County residents.

116-4 4. Hydrocarbon leakage into the Hickory Sands fresh water aquifer would affect the livelihood of 200,000 plus residents of several counties in West Central Texas which includes Tom Green County and the city of San Angelo which are dependent on water from the Hickory Sands Aquifer through several rural water supplies such as the Millersview-Doole Water Corperation.

116-5 5. In the appendix section of the EIS, page c-9, it states that 41.85 % of hydrocarbons are available for dissolution in water. I have enclosed information which shows that the taste and odor threshold for raw crude is 0.1 to 0.5 mg/l (Kikor 1951) and gasoline is 0.005 (Melpolder 1953). Since crude oil contains gasoline, naptha, and other lighter hydrocarbons, I would recommend that the EIS show the number of barrels of oil needed to contaminate to tastable limits the reservoirs which are in the sensitive areas of the pipeline including Stacy Lake.

116-6 6. I would recommend that you address the issue of oil company liability in the event of pipeline leakage. The EIS mentions that 8.8 pipeline spills can be expected along the Northern route in 40 years of operation with an average spill size of 3400 barrels. A major spill of 64,000 barrels can be expected in the Twin-Buttes Reservoir near San Angelo. Who will pay for clean-up operations and filtration systems to remove dissolved hydrocarbons from this public water supply? A filtration system for the city of San

RESPONSE TO LETTER 116

116-1 Please refer to the response to Comment 87-4 regarding the designation of Stacy Reservoir as a sensitive area.

116-2 Please refer to the response to Comment 6-4.

116-3 Please refer to the response to Comment 6-3 and 35-1.

116-4 Please refer to the response to Comment 6-3 and 35-1.

116-5 Crude oil does not contain gasoline. Gasoline is a product of distillation at high temperatures. Other light hydrocarbons are molecularly bonded to the large hydrocarbon chains, therefore, the taste and odor threshold values for raw crude, 0.1 to 0.5 mg/l, should be used rather than those for gasoline. Please refer to Modifications and Corrections section for page A-1 in the Final SEIS.

116-6 Your concern of a major pipeline break with manual valves at the South Concho River crossing is noted. We have recommended remote-control block valves, thereby reducing the potential volume to approximately 2,500 barrels rather than 64,000 barrels. Please refer to Appendix B of the Draft SEIS, page B-53 for discussion of the preliminary Oil Spill Contingency Plan for the South Concho River crossing. Should a spill occur in the Twin Buttes Reservoir, AAPL would be responsible for the containment, cleanup, and filtration of water. Please refer to the response to Comment 18-2 concerning liability.

LETTER 116

116-6 Cont. Angelo, Texas is expected to cost over $40 million dollars. Perhaps the company should be required to post bond for $50 million dollars or more to provide for filtration systems to remove hydrocarbons from water reservoirs and aquifers as a result of major pipeline spill contamination.

116-7 7. The .281 wall thickness of the pipe tested at 125 % of operating pressure is not sufficient in the sensitive areas. I would recommend the pipe wall thickness to be a minimum of .500 tested to 150 % or 200 % of operating pressure.

I appreciate the opportunity to make these additional comments concerning the All American Pipeline and urge you to give them serious consideration.

Sincerely,

Ralph E. Hoelscher

Ralph E. Hoelscher
Route 2 Box 50
Miles, Texas 76861
Ph: 915 468-2592

RESPONSE TO LETTER 116

116-7 AAPL's proposed hydrostatic test procedures meet the criteria in 49 CFR Part 195. The pipe wall thickness is 0.28 inches in all places except river crossings and the Edwards Aquifer recharge zone, where it is 0.50 inches.

for the removal of the contamination; these will be dealt with in a later section of the paper.

There is a lack of data relating to the toxicity of the components of oil to humans and test animals. The dose of kerosine required to kill 50 per cent of a rabbit population (LD_{50}) has been given as 28,350 mg/kg of body weight (Spector 1955), indicating a relatively low toxicity. A report on a study of available data made on behalf of the American Petroleum Institute concludes that the orders of magnitude of the toxicity of various components of oil are such that hazards to human health will not arise from drinking oil-polluted water (Anon 1956). The contamination would become aesthetically objectionable at concentrations far below the chronic toxicity level. The possibility of toxic effects due to fuel oil additives has been referred to by Zimmerman (1964): an incident where a skin condition was attributed to the consumption of water containing tetra-ethyl lead has been reported in Sweden.

By far the most serious aspect of the presence of oil in water, however, is its effect on taste and odour. Data compiled from various sources on the threshold odour concentration of different oil products in water are presented in Table I.

TABLE I

Threshold odour concentration of oil products

Product	Threshold odour concentration (mg/l)	Reference
Raw petroleum	0·1-0·5	Kirkor 1951
Refined petroleum	1-2	Kirkor 1951
Deodorized kerosine	0·082	Cohen 1961
Commercial gasoline	0·005	Melpolder *et al.*, 1953
Petrol (with oil additive)	0·00005	Holluta 1961
Fuel oil	0·5	Gibbons 1940
Fuel oil	0·22	Holluta 1961
Heating oil	0·3-0·6	Gibbons 1940
Diesel oil	0·0005	Holluta 1961
Lubricating oil	25	Gibbons 1940
Lubricating oil	0·5	Holluta 1961
Engine oil	1	Holluta 1961

Discrepancies between the results of different workers are probably due to differences in experimental technique and in the concentration of minor constituents in the products tested. Concentrations well below 1 mg/l of a number of products can cause serious odour problems. Odours associated with petroleum products become musty on ageing, probably as a result of biochemical degradation, and they may also become considerably intensified after chlorination, particularly if phenolic compounds are present. Thus the

THE JOINT PROBLEMS OF THE OIL AND WATER INDUSTRIES

Proceedings of a Symposium held at the Hotel Metropole, Brighton 18-20 January 1967

Edited by
PETER HEPPLE

THE INSTITUTE OF PETROLEUM
61 New Cavendish Street
London, W.1
1967

Sole Agents for Overseas Sales
The Elsevier Publishing Company, Amsterdam, London, New York

LETTER 116 (CONTINUED)

LETTER 117

April 21, 1987

To: Mr. William Haigh
Bureau of Land Management

We the undersigned respectfully request that the following considerations be addressed in the final Environmental Impact Study for the proposed All American Pipeline, Northern Alternative:

117-1 1. A "worst case scenario" must be studied for Twin Buttes, Nasworthy, and Stacy reservoirs;

117-2 2. The Stacy dam area must be designated a "Sensitive Area" and studied intently;

117-3 3. The EIS must address the problem of soluble hydrocarbons in detail;

117-4 4. Finally, we endorse the enclosed written testimony of expert consultants and urge that it be included in the final EIS.

Ruth G. McGill Mrs
Sewis Runion
George DeWolf
Hardy Turner
Harold Pettitt
E.L. McMillan
Clay F. Atkins
Bert Keyes
Sally Powers

RESPONSE TO LETTER 117

117-1 The Oil Spill Contingency Plan in Appendix B of the Draft SEIS has addressed potential oil spill occurrence for the South Concho River crossing above Twin Buttes Reservoir. Please refer to Modifications and Corrections for page B-53. Pecan Creek is intermittent at the pipeline crossing above Lake Nasworthy. The pipeline was realigned below the Stacy Dam and Reservoir; thus, it would not impact the future pool or dam area of the proposed reservoir. Please refer to the response to Comments 6-4 and 87-4.

117-2 We have designated the Colorado River crossing below Stacy Dam as a sensitive area, based on the Concho water snake and potential downstream water use. However, this crossing will not affect the Stacy Dam or Reservoir. Please refer to the response to Comment 87-4.

117-3 Please refer to the response to Comment 6-3 and 35-1.

117-4 We have reviewed and evaluated the expert testimonies of the consultants submitted in regard to the Final SEIS. Please refer to the responses to Letters 118 through 123 for the written comments of these experts.

LETTER 118

2544 Sleepy Hollow
San Angelo, TX 76904
(915) 944-0330
21 April 1987

William Haigh, Federal Project Mgr
Bureau of Land Management
1695 Spruce Street
Riverside, CA 92507

Dear Mr. Haigh:

As a professional archeologist, I am commenting upon the completeness and accuracy of the Draft Supplemental Environmental Impact Study (SEIS) prepared by Environmental Research Technology in relation to the impact on cultural resources by the installation of the All American Pipeline (APPL). These comments reflect my personal opinions alone and in no way are intended to represent the archeological community in Texas or the Texas Historical Commission.

It is germane to emphasize specific cultural resource statements contained in this SEIS:

a. "To date, less than 5 percent of the total land area within the Northern Alternative pipeline corridor has been intensely inventoried for cultural resources." (Section 3.3.8.3, page 3-149, para 1)

b. "The central Texas Paleoindian manifestation is poorly understood due to a dearth of preserved components...No Paleoindian sites have been recorded within the northern corridor." (Section 3.3.8.3, page 3-152, para 3)

c. "Archaic occupation is only slightly better documented (than Paleoindian)...There are virtually no data about site types." (Section 3.3.8.3, page 3-152, para 4)

d. "Late Prehistoric sites...are poorly known in the project vicinity, and the full range of potential site types has not been described." (Section 3.3.8.3, page 3-152, para 4)

e. "Early Contact and Late Contact Historic Indian sites are virtually unknown in the project vicinity..." (Section 3.3.8.3, page 3-153, para 1)

As can be concluded from the statements above (which are certainly accurate), the paucity of data regarding prehistoric and historic aboriginal occupation of West Central Texas have resulted in more questions than answers. This region is a poorly understood, poorly documented "gray area" which manifests the infusion of cultural traits from many other regions. For example, ceramic styles and projectile points discovered

RESPONSE TO LETTER 118

LETTER 118

here reflect the Trans-Pecos, Southern, Central, and Eastern Regions, as well as the Lower Plains Region which transcends state boundaries. More highly developed cultures to the east (Caddo and Mississippian), south (a variety, including coastal), west (Hohokam, Mogollon, and Anasazi), and north (Horse Indians and others) most likely conducted trade through West Central Texas.

For these reasons alone, the Programmetric Memorandum of Agreement (PMOA) and supplemental Memorandum of Agreement (MOA) between the Bureau of Land Management (BLM) and the Texas State Historic Preservation Office (SHPO) outlined in Section 4.7.8, pages 4-188 to 4-192, have significant implications. An intensive cultural resource survey of all lands affected by the project east of McCamey toward Waco then southeast toward Houston should assist in one of the paramount tasks facing Texas archeologists today - a trans-regional synthesis and a better understanding of cultural diffusion.

118-1 The requirements of the PMOA and supplemental MOA are comprehensive and precise. A survey interval of a maximum of 50 feet between transects along a 200-foot corridor right-of-way (ROW) dictates at least four linear sweeps along the entire ROW, which appears to be adequate coverage. Enforcement of the terms and conditions of the PMOA and supplemental MOA by the SHPO will ensure derivation of maximum cultural resource data.

In short, the SEIS accurately points out the egregious lack of data and the difficulty in assessing cultural resource significance, while advancing a reasonable set of requirements to address these challenges along the APPL Northern Alternative pipeline corridor.

Respectfully Submitted,

J. A. Jaquier
Archeologist

cc: Mr. Robert Mallouf
State Archeologist

RESPONSE TO LETTER 118

118-1 Your comment regarding this issue is noted. Please refer to the response to Comment 75-1 and Mitigation Measures CR-1 and P-1 in Appendix A.

LETTER 119

Richard D. Funk
5422 Beverly
San Angelo, Texas 76904

April 22, 1987

Mr. William Haigh, Project Manager
Bureau of Land Management
1695 Spruce St.
Riverside, CA 92507

Dear Mr. Haigh:

The purpose of this letter is to let you know that I am a political candidate for mayor of the city of San Angelo and that I endorse and concur action taken by and submitted to the Bureau of Land Management.

119-1 In addition, I believe it is necessary to sleeve the pipe on the upstream tributaries to Twin Buttes, Lake Nasworthy, and the Stacy Dam. The sleeving, in addition to the cutoff valves, will ensure that should a leak occur no water soluable hydrocarbons will contaminate the water supply for the large population centers who rely on these reserves for water.

Sincerely,

Richard D. Funk

RDF/kp

cc: Dr. Ruth G. McGill

RESPONSE TO LETTER 119

119-1 Sleeving the pipe at river crossings goes beyond standard practice for modern pipelines. Mitigation Measure SS-2 in Appendix A to provide remote-control valves will be effective at reducing spill volumes into these water bodies and minimizing subsequent impacts. In addition, AAPL would utilize 0.500-inch pipe (rather than 0.280-inch pipe) at river crossings.

LETTER 120

M. J. AIKEN

CONSULTING PETROLEUM GEOLOGIST

April 23, 1987

MR. WILLIAM HAIGH, PROJECT MANAGER
Bureau of Land Management
1695 Spruce St.
Riverside, Ca. 92507

Dear Mr. Haigh:

The Draft Environmental Impact Statement for the Proposed All American Pipeline Project prepared by Environmental Research Technology for the Bureau of Land Management contains information necessary for the protection of sensitive resources; however, the report minimizes some of the negative effects on our resources.

120-1 The SEIS report indicates that the area related to the Northern Alternate Route is sparsely populated. In contrast, the city of San Angelo, with an estimated population of 85,000, obtains the municipal water from the Twin Buttes Reservoir. The pipeline traverses approximately 84 miles of the Buda Limestone (Cretaceous) and the Edwards Group (Cretaceous) within the basin or area encompassed for the Twin Buttes Reservoir.

120-2 The report states that any spill into these streams would temporarily make the water unusable for irrigation and municipal uses and that the impact on the reservoir is anticipated to be minimal. This is not proven.

120-3 The future of San Angelo depends on the quality of stream and ground water flowing into the Twin Buttes Reservoir; therefore, additional consideration needs to be given to the protection of the water resources of the area.

120-4 The SEIS raises more questions than answers. Land owners and local experts, familiar with the area, should be consulted prior to and during the project.

Technical contribution will be forthcoming.

Respectfully submitted,

M. J. Aiken

M.J. Aiken, Geologist

316 SOUTH EDDIN HEIGHTS — P. O. BOX 3766 — SAN ANGELO, TEXAS 76902 — 915/658-4365

RESPONSE TO LETTER 120

120-1 Please refer to the response to Comment 6-4.

120-2 Please refer to the response to Comment 6-4 regarding oil spill impacts to surface water supplies.

120-3 Please refer to the response to Comment 6-4 regarding oil spill impacts to surface water supplies.

120-4 The mitigation measures outlined in Appendix A of the Final SEIS are designed to reflect changes in technology and other information regarding sensitive areas and other areas of concern. The BLM Authorized Officer will incorporate, as appropriate, this new information to reduce potential impacts along the Agency Preferred Alternative.

LETTER 121

LEWIS RUNION
P. O. BOX 3503
SAN ANGELO, TEXAS 76902-3503
PHONE (915) 942-7523
PHONE (915) 944-4625

Mr. William Haigh, Project Manager
Bureau of Land Management
1695 Spruce St.
Riverside, Ca 92507

4/23/87

Dear Mr. Haigh,

121-1 I can understand that the property owners and those people who depend on the Edwards aquifer for water appreciate the re-designation fo the proposed All-American Pipeline. As a property owner and geologist in the proposed new area, I do hereby request that a more accurate study be made before allowing the pipeline to cross our watershed and aquifers. If they endanger the Edwards, they also endanger ours.

121-2 We have several local aquifers in the Irion, Tom Green and Concho County areas which are kept alive by rainfall and stream flow on the Middle Concho River, Spring Creek, Dove Creek, South Concho River, North Concho River, Main Concho River, Pecan Creek and Colorado River. The proposed route would affect all these streams except the North Concho River, so all these water sheds should be designated as SENSITIVE areas.

121-3 It is obvious that the proposed route through this area is due to the cheaper cost of digging along these water sheds rather than across hills and mesas in this area. A similar pipeline leak that might have affected the Edwards aquifer would affect Twin Buttes Resovar if it occured along the Middle Concho River, Spring Creek, Dove Creek or South Concho River Water Sheds. A similar leak along Pecan Creek Would affect Lake Nasworthy. A similar leak on the Main Concho River or Colorado River water sheds would affect the new Stacy Resovoir which is under construction now.

These should all be SENSITIVE areas and very strict specifications and inspection proceedures should be followed while under construction, not afterwards when the potential leak occurs.

121-4 Probably the most logical and economical for American Pipeline (if these rules are in effect and enforced) would be to move the proposed pipeline further north where the only SENSITIVE area would be Lake Spence water shed. We have enough problems with faulty drilling for oil through the Coleman Junction formation which has ruined the water in a lot of our area. We do not need a potential problem with a pipeline as the Edwards Aquifer area does not.

Thank You,

Lewis Runion

Lewis Runion

RESPONSE TO LETTER 121

121-1 Please refer to Comments 6-3 and 35-1.

121-2 The Northern Alternative does not cross the Middle Concho River, North Concho River, or the Main Concho River. However, the pipeline does cross tributaries to the Main Concho River. The South Concho River, Pecan Creek, and the Colorado River have been identified as major crossings and will receive special attention. Please refer to the response to Comment 47-4 and Mitigation Measure SS-2 in Appendix A.

121-3 Please refer to the response to Comment 6-4.

121-4 Please refer to the response to Comment 6-4 and 87-4.

LETTER 122

April 24, 1987
1302 Shafter
San Angelo, Texas
76901

Mr. William Haigh
Bureau of Land Management
1695 Spruce St.
Riverside, CA 92507

Mr. Lanny Reid
ERT Project Manager
1716 Heath Pkwy.
Ft. Collins, CO 80524

Gentlemen:

Enclosed is the written testimony on the proposed All-Americas Pipeline Draft EIS , of Mr. Andrew L. Williams, Jr., consulting engineer. Mr. Williams reviewed the EIS at the request of Tom Green County landowners.

122-1 After talking with Mr. Williams, I am confirmed in my own opinion that the draft EIS is still a 'one-size-fits-all' production, yet to be custom-tailored for the needs and security of the Northern Route. The expert consultants who have submitted additional testimony this month are at your service to discuss details and particulars of the pipeline route in north central Texas.

Sincerely,

Ruth G. McGill M.D.

Ruth G. McGill, M.D.

RESPONSE TO LETTER 122

122-1 The SEIS personnel will review fully and utilize the information provided by the expert consultants concerning the Northern Alternative. Please see Section 2.2 of the Final SEIS for summaries and responses to the Public Testimonies.

LETTER 123

ANDREW L. WILLIAMS, JR., P.E.
CONSULTING ENGINEER-WATER RESOURCES

8806 BONHOMME ROAD
HOUSTON, TEXAS 77074

713/771-4297

April 23, 1987

Mr. William Haigh
Bureau of Land Management
1695 Spruce Street
Riverside, California 92507

Mr. Lanny Reed
ERT Project Manager
1716 Heath Pkwy.
Ft. Collins, Colorado 80524

Gentlemen:

As a ground water specialist consulting with a group of Tom Green County landowners, who are represented by Dr. Ruth McGill, I have listed below some concerns about the SEIS report of the affects of the Northern Alternative Alignment of the All American Pipeline on the quality and quantity of the ground water in the highly sensitive Edwards Plateau Aquifer underlying 117 miles of the pipeline.

2-555

123-1 This aquifer is the single source of water for many persons for all puposes. As noted in SEIS 3.2.2.1, rapid response recharge is limited to erratic, scant precipitation of this semi-arid area. Many localized areas of poor quality water occur in oil fields where past practices of uncased oil wells and brine disposal pits have degraded ground water quality, and where natural dissolution of gypsum occurs. Very little surplus fresh water is available for dilution of contaminants (such as the unspecified bacteriacide and foam used in constructing the pipeline) or for the predicted oil spills degradation.

123-2 Confirmation that the construction materials and procedures comply with industry standards and regulatory agencies' approvals for use in drinking water systems is a critical ommission in the SEIS.

123-3 The fact that this limestone rock aquifer's zones of higher permeability fractures, solution channels, and cavities are exposed to the land surface increases the vulnerability of the aquifer to contamination by overland surface runoff. Numerous perforations of the aquifer by wells, test holes, abandoned oil and seismic test holes, and other excavations increase the infiltration hazard. "Break out" of oil field brines from leaky casings and/or improperly plugged abandoned wells and test holes further jeopardizes water quality. Any

RESPONSE TO LETTER 123

123-1 Please refer to the response to Comments 6-3 and 35-1.

123-2 Please refer to the Modifications and Corrections section for page 4-8 for information on construction-related fuel spills.

123-3 Please refer to the response to Comment 6-2.

LETTER 123

123-3 Cont. blasting increases the risk of disturbing existing wells and loosening plugged oil wells to upset the delicate water quality balance. Once contaminated, the Edwards Plateau Aquifer defies effective recovery of the contaminant.

RECOMMENDATION: Realign pipeline to minimize the 117 miles overlying the Edwards Plateau Aquifer.

123-4 I am shocked by the omission of the role of state agencies in protecting our ground water resources, except in obtaining permit to operate the pipeline and Appendix B OSCP. The State of Texas requires licensing of water well drillers, reporting of well logs and undesirable water encountered. Standards for drilling completion, capping and plugging wells, abandoned wells, and test holes are defined and enforced by the Texas Water Commission.

The Texas Department of Health enforces rules and regulations for public water systems, inspects facilities, analyses water samples, and certifies water utilities operators.

RECOMMENDATION: Consult with state, regional and local water agencies and authorities as a preconstruction activity. SEIS 2.2.2.1.

123-5 RECOMMENDATION: Perform an on-the-ground survey of the sensitive aquifer areas. Engage a competent person, knowledgeable about local drilling practices, to recognize, identify, inventory, and report a complete description of each significant perforation of the aquifer, including water, oil, gas, salt, sulphur, uranium, geothermal, injection and other wells, test holes, abandoned perforations, brine and gravel pits, stock tanks (ponds), mines, caves, springs, bog and wet areas. The area of investigation should fit the area of influence of a major spill (a geyser of hot oil under 1000 psi). The survey data should be evaluated by the project manager to assess the impact of aquifer perforations on the pipeline alignment, design, construction, operation, and abandonment, with notification to regulatory entities and land managers. Report 274 "Underground Injection Control Technical Assistance Manual" by the Texas Department of Water Resources and related publications may be of value.

123-6 As a citizen and Texas registered professional engineer, I am concerned by the omission of the role of the professional engineer in responsible charge of the pipeline design, construction, and abandonment as required by the State of Texas in order to protect the public health, safety and welfare. There is a consistent lack of specificity and recognition of local customs, regulations, and laws and physical constraints.

RESPONSE TO LETTER 123

123-4 Please refer to the response to Comment 6-15.

123-5 Please refer to Mitigation Measures GW-1 and GW-2 in Appendix A.

123-6 AAPL has contracted with an engineering consulting firm regarding pipeline design. This firm has several registered professional engineers experienced in the pipeline industry. The SEIS team personnel have similar experience and background. BLM will supervise construction along with representatives of the State of Texas.

LETTER 123

123-6 Cont. RECOMMENDATION: Engage competent professional engineers registered to practice in Texas to be in responsible charge of design and supervision of engineering construction of the pipeline, with appropriate individually sealed plans and specifications.

123-7 SEIS 2.2.5 Abandonment is unclear as to intent.

RECOMMENDATION: Fill the abandoned pipeline with a permanent solid to reduce ground water flow through eroded pipe.

123-8 SEIS 2.2.2.8 Backfilling is vague.

RECOMMENDATION: Construct an impermeable backfill to confine oil leaks to the pipeline trench. Conventional clay backfill may be reduced to dust as its moisture content is reduced by the hot oil. Jacketing the pipeline with an impervious pipe may be a more effective oil leak containment.

123-9 SEIS 4.7.2 Groundwater Mitigation GW-1 is incomplete. Inventory and evaluation of aquifer perforations is omitted.

123-10 GW-2 is incomplete in omitting site specific application of "Standards by Ritchie (1976)" for constructing and abandoning deep well cathodic beds. Omitted from References, also. Ritchie is not known by local cathodic protection or water well industry.

Comprehensive planning and design, superior construction, wise management in operations and abandonment may result in a safer pipeline.

If additional comments on the above or related ground water items are desired, please feel free to call me.

Sincerely,

Andrew L. Williams, Jr., P.E.
Texas Water Well Driller's License No. 33

ALWjr/f

cc. Ruth G. McGill, M.D.

RESPONSE TO LETTER 123

123-7 Abandonment practices proposed by AAPL will follow standard industry practices.

123-8 Construction of an impermeable trench along the pipeline route or jacketing the pipeline with a second pipe goes beyond standard practice for modern pipeline design and construction. Other mitigation measures have been proposed to reduce potentially significant impacts from oil spills.

123-9 Please refer to Mitigation Measure GW-1 in Appendix A.

123-10 Your comment concerning deep well groundbeds is noted, please see Modifications and Corrections section for page 2-7.

3.0 MODIFICATIONS AND CORRECTIONS

3.1 TEXT REVISIONS TO THE DRAFT SEIS

Section 3.1 presents page by page text corrections to the Draft SEIS in tabular form. Column 1 indicates the page in the Draft SEIS on which the correction occurs; Column 2 indicates the paragraph in which the correction occurs (a partial paragraph at the top of the page is numbered as 1); Column 3 indicates the line within the paragraph; and Columns 4 and 5 present the text as it occurs in the Draft SEIS ("Is") and how it should be corrected or modified ("Should Be").

3.1 TEXT REVISIONS TO THE DRAFT SEIS

Page	Paragraph	Line	Is:	Should Be:
1-3	Table 1-1			See Modifications and Corrections Section 3.2.
2-1	2	1	The All American Pipeline, including the Texas segment, would operate as an interstate common carrier.	The All American Pipeline, including the Texas segment would operate as an interstate common carrier of crude oil.
	3			Add: Approval of this project by BLM would restrict the pipeline to transport crude oils from McCamey to the Texas Gulf Coast. Any change in the intended use of the pipeline would be considered an amendment, subject to the approval of BLM. Should BLM determine that the intended change could have potentially significant environmental consequences, BLM may require that another Environmental Impact Statement be prepared to address the proposed modification.
2-5	5	5	respectively.	Add: The 0.500-inch diameter wall thickness pipe is specified by AAPL at major water crossings and within the Edwards Aquifer recharge zone.
	5	7	900 psig at 300,000 BPD throughput	Add: and 1,440 psig at 450,000 BPD throughput
	5	8	would be insulated.	Add: to accommodate heating of crude oil shipments as required. Crude oil would be heated only to the extent necessary to reduce the viscosity sufficiently for shipment. Crude oils with a high percentage of lighter fractions would not be heated.
	5	8	Outlet temperature of the crude oil from the heater stations would average 160°F.	Outlet temperature of the crude oil from the heater stations when operating would average 160°F.
	5	11-14	minimize heat loss from the line.	Add: The pipe coating, where not insulated, would consist of an application of adhesive-based primer coat followed by an inner and outer wrap of polyethylene tape. Double-wrapping is specified by AAPL at cased crossings, as well as river, creek, and swamp crossings. The proposed coating is designed to withstand temperatures up to 180°F without breakdown.
2-7	2			Add: All deep-well groundbeds will be drilled, cased for the top 20 ft, and grouted, loaded with anodes, backfilled with coke breeze, and cement capped. In essence, the groundbeds are abandoned at construction per the terms of normal water well drilling standards. Surface water is precluded from entering the hole from the top due to the casing and cap. The useful life of the deep-well groundbeds (from a current output standpoint) is 20 years. However, once the installation is completed, the groundbeds are considered abandoned in place for all practical purposes.

Page	Paragraph	Line	Is:	Should Be:
2-13	Table 2-6			See Modifications and Corrections Section 3.2.
2-17	Figure 2-3			See Modifications and Corrections Section 3.2.
2-20	3	10		Add 3rd bullet: • Establish small brush piles along the ROW where appropriate (i.e., away from potential areas of oak wilt contamination) and where agreeable to the landowner.
2-22	2	5	would be a minimum of 36 inches.	would be a minimum of 36 inches measured after backfilling and grading.
	6	4-5	would be subjected to non-destructive tests...ultrasonic tests.	...non-destructive tests such as radiography (x-ray), magnetic particle inspection, dye penetrant, or ultrasonic tests.
2-23	1	3	radiographically inspected	non-destructively inspected.
	6	6-8	In certain areas...sand or earth backfill.	Delete
	6			Add: Frozen soil in large lumps, rocks, gravel, or like materials shall not be backfilled directly onto the pipe in order to prevent damage to the pipe coating. Where such materials are encountered, they will be moved to the edge of the ROW prior to backfilling, and sufficient earth or sand to form a protective padding or cushion between the pipe and gravel or rock will be used as backfill. Where rock is encountered, the bottom of the ditch and the top and sides of the pipe shall be covered with 6 inches of material approved by AAPL. Any surplus rock generated by the ditching and pipe placement will be disposed of on private lands in washes or other designated disposal sites previously agreed on between the contractor and landowner. Also some of the excess rock will be used to rock rip rap stream banks to prevent soil erosion. If no agreement can be reached with landowner another suitable disposal area will be obtained and excess rock removed to this site.
2-24	1	3	leakage under pressure.	Add: Similar tests will be performed for piping at the pump/heater stations.
2-27	2	4	...the existing pipe and...	...the existing pipe in accordance with DOT specifications and...
2-29	1 (bullet 5)	10	foam material.	Add: The sealant employed will be a high-density, microcellular polyurethane foam coded FE-5107. This product is manufactured from specific raw materials which impact oil resistant properties to the resultant polymer. The materials used are also resistant to polymer degradation by hydrolysis and increased moisture vapor permeabilities. The sealant will be injected into the aquifer at the bottom and up both sides of the trench. The sealant-filled entrances will also be capped with the FE-5107 sealant.

Page	Paragraph	Line	Is:	Should Be:
				These caps will be 1/16-inch thick and extend 10 to 15 inches on each side of the sealed entrance. In addition, a preformed polyurethane sheet will be laid over the bottom and up the sides of the trench to provide additional seal and containment. This sheet will extend at least 10 ft beyond the sealed aquifer entrances. The outer edges of the sheet will be capped with the FE-5107 polyurethane foam. These caps will extend over the polyurethane sheet by 10 to 15 inches at a thickness of 1/16 inch. The estimated life of the foam sealant is 50 to 75 years, and even longer if not exposed to ultraviolet light.
2-31	1	4	unattended operation...	unattended operation during normal operating conditions and...
	2	7		Add: The complete SCADA system, including the Master Control Center and all RTUs in the field, will have a backup power supply with batteries to provide for uninterrupted power.
	4	8-9	leak of 10 percent...within 10 seconds.	leak of 10 percent of flow (21 barrels per minute at 300,000 BPD flow rate) or more could be detected within 1 minute.
	4	12	3-minute time basis and 0.2 barrel per minute on a 30-minute time basis.	10-minute time basis and 0.4 barrel per minute on an 8-hour time basis. Detectable leak rates are about 50 percent higher when the pipeline operates at 450,000 BPD.
2-36	Table 2-9			See Modifications and Corrections Section 3.2.
2-37 to 2-39	Section 2.3.3			See Modifications and Corrections Section 3.3.
	Table 2-10a			See Modifications and Corrections Section 3.2.
2-40 to 2-46	Section 2.7			See Modifications and Corrections Section 3.3.
2-42	Table 2-12			See Modifications and Corrections Section 3.2.
3-2	6	1	Eight municipal water supplies	Nine municipal water supplies
3-3	Table 3-1			See Modifications and Corrections Section 3.2.
	Table 3-1a			See Modifications and Corrections Section 3.2.
3-5	Table 3-2			See Modifications and Corrections Section 3.2.
3-6	Table 3-3			See Modifications and Corrections Section 3.2.
3-8				See Modifications and Corrections Section 3.2.
3-13	3	4	...400 ft in Dimmit County to approximately 3,000 ft in Atascosa County...	...500 ft in Dimmit County to approximately 2,000 ft...from about 30 to 75 ft. The dip of this aquifer, based on the dip of the top of the Carrizo Sand, is southeastward.

Page	Paragraph	Line	Is:	Should Be:
				Add: The Carrizo Sand and the Wilcox Group, undifferentiated, crops out in a belt ranging from 5 to 15 miles wide. The belt is about 14 miles wide where it trends northeastward across eastern Caldwell County. The proposed pipeline route crosses the Carrizo-Wilcox Aquifer and its downdip in Bastrop, Caldwell, and Fayette Counties.
3-14	3			Add: Figure 3-1e illustrates the approximate altitude of the top of the aquifer. The Hensell member has a general east and southeast dip, with an increased rate of dip in the Balcones Fault Zone. In Gillespie County, the Hensell Sand overlying the Ellenberger Aquifer consists of poorly-sorted sand, silt, and clay with beds of limestone common. The upper part of the member is generally fine grained, while the lower part consists of coarse, angular sand. A March 1979 aquifer test, conducted by R. W. Harden and Associates on behalf of the City of Fredericksburg, showed that in the vicinity of the Boerner 5 production well, there is communication between the lower 10 ft of the Hensell Sand and the upper 150 ft of the Ellenberger Aquifer. According to the city engineer, drillers' logs for this well indicate that the Hensell-Ellenberger contact is roughly 82 ft below surface and that most of the water comes from a fractured zone roughly 120 ft below ground surface. The communication between the coarse more permeable lower Hensell and the upper portion of the Ellenberger does not give an indication of the ease or difficulty a surface oil spill would have in penetrating the upper finer grained Hensell and reaching the water table. In general, the rate and extent of subsurface oil migration is slower and less extensive in porous granular aquifers. Based on the extent of the Hensell member, the area traversed by the proposed pipeline and the hydrogeologic characteristics indicated in Section 3.2.2.1, the Ellenberger-San Saba in general is not considered a sensitive aquifer, therefore, it is not included in Table 3-1. However, in Gillespie County, the City of Fredericksburg has 5 water supply wells located less than 0.5 mile south of the Pedernales River and 1,000 ft north of the original Proposed Route. Because of the uncertainty in the communication between the Hensell Sand and the Ellenberger Aquifer in this area and because the Pedernales River may complicate the local hydrogeology, the area within 2,000 ft of any supply wells for the City of Fredericksburg will be considered sensitive. Also please refer to Mitigation Measures GW-1 and GW-3 in Appendix A of the Final SEIS.

Page	Paragraph	Line	Is:	Should Be:
3-19	Table 3-5			See Modifications and Corrections Section 3.2.
	Table 3-5a			See Modifications and Corrections Section 3.2.
	Table 3-5b			See Modifications and Corrections Section 3.2.
3-21	1	4	surface expression of bedrock.	Add: The hydraulic characteristics and scour potential of major streams crossed by the proposed route are shown in Table 3-5a in the Modifications and Corrections Section 3.2.
3-22	Table 3-6			See Modifications and Corrections Section 3.2.
3-27	Table 3-7			See Modifications and Corrections Section 3.2.
3-35	5	10	...kills (Morgan 1986).	Add: An extensive salt marsh is located in Oyster Creek near the coast.
3-36	1	14	(Benefield 1986).	Add: Extensive coastal salt marshes and wetlands are located at the mouth of Chocolate Bayou.
3-37	Table 3-9			See Modifications and Corrections Section 3.2.
3-38	5	1-2	...Brazos River and Oyster Creek is without large bays and lagoons.	...Brazos River, San Bernard River, and Oyster Creek is without large bays and lagoons.
	5	4	However, important marine resources are still present.	However, extensive marshes, wetlands, and shallow water environments exist in the Cedar Lake system, the Gulf Intracoastal Waterway, and the mouthes of the rivers (Johnson 1977). Important marine resources in these coastal areas, in terms of numbers and weights, include...
3-39	2	2	No federally-listed endangered or threatened species are known to occur	No federally-listed endangered or threatened fish species are known to occur
3-42	5	5		Add: This type includes the live oak-Ashe juniper parks and woods that occur along the Balcones Fault line in Hays County.
3-53	Table 3-13	Column Heading	Status (Federal/State)	Status (Federal/TNHP)
3-56	2			Add: There have been some changes in the designated classification of certain special status species since the preparation of the Draft SEIS. The black-capped vireo was listed in the Draft SEIS and Appendix E as a Federal Candidate Category 1 species. The black-capped vireo is now proposed for listing and is considered a proposed species. Also, the TPWD list of species considered endangered or threatened within the State of Texas was finalized and effective on March 1, 1987; this list has resulted in several deletions and some additions to the classifications provided by the State during the Draft SEIS analysis process. We are currently evaluating these changes and determining the extent of changes and if there would be any significant impacts to any newly-listed species. It is unlikely that this process will be finalizec prior to publication of the Final SEIS; therefore,

Page	Paragraph	Line	Is:	Should Be:
				this information will be forwarded to the BLM Authorized Officer for use in compliance monitoring under Mitigation Measure TB-12 prior to construction.
	3	13		Add: The Texas blind salamander also occurs near San Marcos in Hays County, approximately 12 miles from the Proposed Route.
3-57	Table 3-14			See Modifications and Corrections Section 3.2.
	Table 3-14a			See Modifications and Corrections Section 3.2.
3-58	Table 3-14 (Column 2)	9	FC1	FP[3]
3-59	Table 3-14	12		Add Footnote: [3]FP = Federal Proposed-Endangered.
3-60	5	1	Twenty-three	Twenty-two
	5	1	There is one FC1 species...	There is one proposed federal endangered species...
	5	3	...12 birds...	...11 birds...
	5 (bullet 1)	5	Federal Category (FC1) - data available to support threatened or endangered status.	Federal Proposed-Endangered (FP) - species proposed to be listed as endangered.
	6	1	(FC1). There is one FC1 species...	(FP). There is one FP species...
	6	5-7	(Appendix E, Map E2-8). A habitat survey...	(Appendix E, Map E2-8). A habitat identification survey was conducted by helicopter on June 10, 1987. There are some areas with moderate to good quality habitat in Hays, Blanco, Gillespie, and Kerr Counties, with the best habitat closer to I-10 in Kerr County. Nine areas were identified during the survey (Table 3-14b). Habitats ranged in size from 20.0 to 270.4 acres.
	Table 3-14b			See Modifications and Corrections Section 3.2.
3-61	1	3	The Texas salamander...	The fern bank salamander...
	5	2	...Louisiana blackbear...	Delete: "Louisiana"
	6	5	...now be extinct.	Add: in Texas.
	7	2	...13 species...	...14 species...
	7	4-5	All of these species are also listed as federally threatened or endangered, and were discussed previously.	All of these species are also listed as federally threatened, endangered, or candidate species and were discussed previously.
	8	1-2	The 15 species not previously discussed include 1 amphibian, 8 reptiles, and 6 birds.	The 5 species not previously discussed include 1 reptile and 4 birds.
	8	2-3	The Rio Grande chirping frog...Harris Counties.	Delete.

Page	Paragraph	Line	Is:	Should Be:
	8	6-8	Seven snakes...all of them.	Delete.
	9	1	Six state...	Four state...
	9	2	The white-faced ibis, coastal least tern, and wood stork...	The white-faced ibis and wood stork...
3-61 and 3-62	9 & 1	3 & 1	Ospreys do not...or reservoir.	Delete
3-47	Table 3-17			See Modifications and Corrections Section 3.2.
3-75	1	3	Pollutants tabulated at the stations include O_3, NO_2, CO, SO_2, and TSP	Pollutants tabulated at these stations include O_3, NO_2, CO, SO_2, Pb, and TSP
	2	4	attainment for ozone.	Add: Also portions of Harris County including Alpine and the ship channel area near Deer Park are currently designated non-attainment for TSP.
3-92	Table 3-25 (column 7)	last	12,603,470	101,156,163
3-93	2	2	...oil recession.	Add: and the depressed agricultural economy.
3-95	Table 3-27			See Modifications and Corrections Section 3.2.
3-96	3	5	1986a).	Add: Current production for California and Alaska is about 1,100,000 and 1,900,000 BPD, respectively (see Table 3-28a in Modifications and Corrections Section 3.2).
	5	9	In 1985, demand for crude oil in PADD 5 was 2,463,100 BPD.	In 1985 through April 1987, demand for crude oil in PADD 5 has ranged around 2,300,000 to 2,500,000 BPD (Table 3-31).
	5	11		Add: PADD 5 imports about 50,000 to 100,000 BPD of crude and 10,000 BPD of products (Table 3-31a). In early 1987, PADD 5 is running surplus production of about 700,000 BPD (i.e., 3,000,000 produced plus 200,000 in imports minus 2,500,000 refined equals 700,000 BPD).
	Table 3-28a			See Modifications and Corrections Section 3.2.
3-98	Table 3-29 (Heading)			Add: (Thousands of BPD)
3-99	Table 3-31			See Modifications and Corrections Section 3.2.
	Table 3-31a			See Modifications and Corrections Section 3.2.
3-100	1	8		Add: PADD 3 refineries are currently operating at about 80 percent capacity.
	2	12	refineries even with retrofits. Recent studies for the Southern California Pipeline Systems adds controversy to these earlier predictions; refinery estimates made by the Los Angeles refiners were 200,000 to 300,000 BPD without retrofits (ERT 1986).	refineries' capacity even with retrofits. Recent studies for the Southern California Pipeline systems adds controversy to these earlier predictions. The South Coast Air Quality Management District estimated 169,000 BPD could be refined without retrofits (Murray 1986). The refinery estimates made by the Los Angeles refiners were 200,000 to 300,000 BPD without retrofits (ERT 1986).

Page	Paragraph	Line	Is:	Should Be:
3-107	1		In conclusion, it appears that the proposed pipeline would be capable of transporting the crude oil out of the Santa Barbara Channel and Santa Maria Basin to PADD 5 and PADD 3 refiners and could do so at a competitive transportation cost. Surplus oil in PADD 5 can be shipped by pipeline to Texas and PADD 3 where refineries and markets are in place. The marketplace will ultimately determine the total quantity of oil moved through the All American Pipeline system.	In conclusion, surplus oil production in PADD 5 is currently about 700,000 BPD and will likely continue into the future based on the large Alaska and California reserves. The demand in PADD 5 is about 2,500,000 BPD and will not likely match the combined production and import crude volumes of about 3,200,000 BPD. In PADD 3, the demand is about 6,500,000 BPD, and about half the volume refined is imported foreign crude. At the present time, the heavy PADD 5 crude could displace foreign crudes such as Venezuelan or Mexican crude oil. If demand increases at some future time, the PADD 3 refineries could increase their 80 percent of capacity operating levels and refine both domestic and foreign crude. All American would ship crude oil from California to the Texas Gulf Coast for about $3.50 per barrel. Tankers would charge $4.00 to $7.00 per barrel. Long-term contracts for pipeline shipment and the lower labor requirements for pipeline operation should also make the pipeline economically attractive.
3-105	Table 3-34			See Modifications and Corrections Section 3.2.
3-114	Table (last column)	3	Carrizo-Wilcox 16 Total 335	Carrizo-Wilcox 13 Total 332
	3	4	sensitive areas of aquifers, there are 335 miles of sensitive aquifer	sensitive areas of aquifers, there are 332 miles of sensitive aquifer
	5			See Modifications and Corrections Section 3.3.
3-121	Table 3-41			See Modifications and Corrections Section 3.2.
3-122	Table 3-42			See Modifications and Corrections Section 3.2
	Table 3-42a			See Modifications and Corrections Section 3.2.
3-123	1	1-2	Data for six of the seven...	Data for four of the five...
3-125	6	5		Add: The hydraulic characteristics and scour potential of the major streams crossed by the Northern Alternative are shown in Table 3-42a in Modifications and Corrections Section 3.2.
3-128	8	3	...streams crossed by Northern Alternative (see Section 3.3.3), 14 support important freshwater species...	...streams crossed by Northern Alternative (see Section 3.3.3), 16 support important freshwater species...
	8	6	...Little River, Yegua Creek, Brazos River...	...Little River, Middle and East Yegua Creek, South Bosque Creek, Brazos River...
3-139	4	end		Add: Waterfowl species and habitats are similar to that presented for the proposed route.
3-140	5	3	No state threatened...within this area.	No plant species are recognized as threatened or endangered by the State.
3-142	Table 3-46			See Modifications and Corrections Section 3.2.

Page	Paragraph	Line	Is:	Should Be:
3-145	Table 3-47			See Modifications and Corrections Section 3.2.
	Table 3-47a			See Modifications and Corrections Section 3.2.
3-146	Table 3-47 (Column 2)	4	FC1	FP[3]
	Table 3-47	Last		Add Footnote: [3]FP = Federal Proposed-Endangered.
3-147	8	1	Twenty...	Nineteen...
	8	4	...12 birds...	...11 birds...
		Last		Add: Federal Proposed Species. The black-capped vireo is proposed to be listed as an endangered species. Listing is expected in 1988. All of the highest probability vireo habitat areas were surveyed by helicopter along the Northern Alternative. Most of these areas were agricultural land or grazed pasture, and vireo habitat occurred in only a few small blocks of land. Ten potential areas were identified (Table 3-47b), occurring primarily in Mills and Hamilton Counties. Several of these areas had good quality habitat, although habitat size ranged from 12.5 to 121.1 acres. The best habitat was lightly grazed areas in rangeland with oak scrub that reached the ground.
	Table 3-47b			See Modifications and Corrections Section 3.2.
3-148	1	1	The only FC1 species	The only proposed federally endangered species...
3-163	Table 3-52 continued (column 7)	last	12,603,470	101,156,163
	Table 3-58a			See Modifications and Corrections Section 3.2.
3-178	1	7		Add: The hydraulic characteristics and scour potential of the major streams crossed by the Northern Alternative are shown in Table 3-58a.
3-179	Table 3-59			See Modifications and Corrections Section 3.2.
3-182	Table 3-60			See Modifications and Corrections Section 3.2.
3-198	Table 3-62 (column 3)		threatened	endangered
3-203	1	15	...domestic livestock and exotic ungulates.	...domestic livestock.
3-204	4	8	Table 3-64 lists these species...	Table 3-64 lists these plant species...
3-206	Table 3-65	Column Heading	Status (Federal/State)	Status (Federal/TNHP)
3-208	Table 3-66			See Modifications and Corrections Section 3.2.

Page	Paragraph	Line	Is:	Should Be:
3-209	Table 3-66 (Column 2)	11	FC1	FP[4]
3-210	Table 3-66	Last		Add Footnote: [4]FP = Federal Proposed-Endangered.
	Table 3-66a			See Modifications and Corrections Section 3.2.
3-211	5			Add: Federal Proposed Species. The black-capped vireo is proposed to be listed as an endangered species. Listing is expected in 1988. All of the most likely habitat along the Southern Alternative was surveyed by helicopter. Areas to the north in Crockett County probably provide only marginal habitat. All of the 14 areas (Table 3-66b) identified occur in Val Verde County. This habitat occurs primarily at the heads of small canyons or along limestone outcrops. This habitat is not typical of vireo habitat farther east in Texas, but vireos have been reported in these dry canyon habitats in this part of Texas. These habitat areas, which included oak, juniper, mountain laurel, and madrone ranged in size from 6.3 to 55.2 acres.
	Table 3-66b			See Modifications and Corrections Section 3.2.
	6	1	Twenty-seven	Twenty-six
	6	4	...12 birds...	...11 birds...
	7	1	The only FC1 species...	The only proposed federally endangered species...
3-212	7	1	Thirty-two...	Twenty...
	7	3-4	The 18 species not previously discussed include 1 amphibian, 10 reptiles, and 7 birds.	The eight species not previously discussed include three reptiles and five birds.
	7	4-6	The Rio Grande chirping... ...and Houston areas.	Delete
	7	8-9	Eight snake species are...	One snake species is...
	7	9-11	Exact locations of these species are unknown, but the pipeline is expected to cross habitats used by all of them.	Exact locations of the Texas indigo snake are unknown, but the pipeline is expected to cross habitats used by it.
3-126	4	8	2 miles of the Orchard salt dome west of Richmond where oil, gas, and	2 miles of the Orchard dome oil field west of Richmond where oil, gas, and
	4	10	intersects a 4-mile portion of the proposed Shell Oil Milam lignite mine	intersects a 4-mile portion of the proposed Milam lignite mine
4-2	3	2	...evaluated from two perspectives:	...evaluated from three perspectives:
	3 (add bullet 3)			Add: • Do construction practices contain sufficient precautions to prevent and/or mitigate accidental spills of fuel oil, etc. from pipeline construction equipment.
	5	2	may exceed the...	exceeds the...

Page	Paragraph	Line	Is:	Should Be:
	5	9	...analysis of pipeline design...	...analysis of the preliminary pipeline design...
	6	1		Add: It is standard practice in the pipeline industry not to complete the final detailed engineering design until the route has been determined and all regulatory approvals have been obtained. This is because many engineering details depend greatly on the specifics of the route eventually selected. However, conceptual pipeline design has progressed to the point where reasonable judgements can be made as to its adequacy from a safety perspective.
	6	1	Because the final engineering design is not complete, it is not yet...	Insert: However, it is not yet...
	6	3	operating practices would comply...	operating standards would comply...
4-3	Table 4-1			See Modifications and Corrections Section 3.2.
4-4	1	1	criteria, an independent... is complete...review (Section 4.7.1).	criteria, an engineering evaluation by DOT and/or BLM will be required. A mitigation measure has been included requiring such a review (Section 4.7.1).
	2	8-9	...the line is placed in service.	...the line is lowered into place.
	2	9-14	Although double-wrap polyethylene tape has a long record of effectiveness, superior methods are available such as extruded plastic coating.	The proposed double-wrap...effectiveness and is sufficient for most areas. However, in environmentally sensitive areas such as the Edwards Aquifer recharge zones, the use of epoxy-type coating or an equivalent has been incorporated...
	4	4	pipe corrosion.	Add: Limits have been set at 1 percent for water and 10 parts per million for H_2S. Should analysis indicate impurities above this limit, receipt of the crude will be discontinued.
	6		Delete	Insert: Manual valves require that pipeline personnel be on-site in order to close the valve. This means that should a rupture occur, oil losses would continue until the leak location was identified, and the oil spill response crew reached the valve to close it. For valves which are some distance from the nearest maintenance center, this could take several hours. If the area were sensitive to an oil spill, the continued leak of oil could result in significant environmental damages. In order to reduce oil losses at such areas, remotely-operated valves have been specified as a mitigation measure at valves where proposed response times exceed 1-hour. The specific locations of the remotely-operated valves has been determined by individual resource specialists based on potential oil spill impacts to that resource. For valves which do not require remote-operation, we have specified operation by electric or air impact wrenches as a mitigation measure. This will facilitate accelerated operation of these valves in an emergency.

Page	Paragraph	Line	Is:	Should Be:
4-5	1	1-2	been...(Section 4.7.1)	Delete
	3	4	and heat sensors (fire detectors).	and ultraviolet infrared heat sensors.
	3	7	for the station. A fire involving...	for the station, thus cutting off the supply of oil to fuel the fire. The fire would then be allowed to burn itself out. AAPL personnel would be responsible for responding to a fire at the pump/heater station. Local fire department crews would be notified of the situation and would respond as required to prevent the fire from spreading outside the station. Local fire departments would not participate in the fire suppression activities at the pump/heater station itself.
	3			Add: Concern has also been raised that the use of natural gas-fired heaters at the pump/heater stations adds to the fire and explosion risks. The volatility and explosiveness of natural gas does increase the danger somewhat compared to a pipeline that does not require crude oil heating. However, this danger is only exacerbated should a fire actually occur, which as discussed above is a very rare event. The heaters themselves do not add significantly to the overall risk because this type of equipment is used routinely in the oil and gas industry and has a long history of safe operation. In addition, the automatic shut-down system will block the gas supply to the heater upon detection of a pump/heater station fire.
	4	5	event of fire.	event of fire. However, a mitigation measure has been specified to prevent locating a pump/heater station within one-half mile of any permanent residence or public building. The one-half mile buffer zone provides adequate set back to mitigate the fire/explosion risks.
4-6	2	3	...detected within 10 seconds with a	...detected within 1 minute with a
	5		Delete	Insert: As shown on Table 4-2, slower leaks take longer to detect. In addition, very small leaks may be below the limit of detection by the control system. The lowest limit specified by AAPL regarding their system is 0.4 barrels per minute, which correlates to a leak of slightly less than 600 BPD at a flow of 300,000 BPD and nearly 900 BPD at a pipeline flow of 450,000 BPD. Leaks below this limit would rely on visual means of detection. Prolonged leaks could possibly occur assuming oil did not appear on the surface or in nearby water supplies. However, it is our judgement that in most circumstances, oil should appear on the surface shortly after a leak occurs, because the lost oil would tend to follow the path of least resistance with the back-filled material along and above the pipe eroding away under the pressure of the pipeline leak.

Page	Paragraph	Line	Is:	Should Be:
4-7	Table 4-2			See Modifications and Corrections Section 3.2.
4-8	1	3-4	The pipe manufacturing company is generally responsible for these inspections.	These inspection steps are outlined in Figure 4-1a
	2			Add: Prior to issuance of a purchase order, the capabilities and equipment of each mill was evaluated. Primary assessment was based on ability to meet minimum API requirements as mandated by DOT Office of Pipeline Safety. All manufacturers who supplied linepipe to the project were thus required to meet the stringent standardization levels set for API monogram holders. Pre-production meetings were held for discussion of the supplementary requirements of the AAPL specifications. The supplementary requirements build on the basic API 5L specification and ensure the suitability of the pipe for the exact operating conditions of the project. The supplementary requirements and agreements reached in the pre-production meetings are summarized in manufacturing procedure documents prepared by each mill. With the exception of dimensional characteristics and the maximum on allowable manganese content which follow API, the AAPL product is distinctly superior to standard linepipe supplied by API accredited mills. Each linepipe manufacturer has multiple in-house quality control procedures which are applied sequentially as the product passes through the mill. AAPL instituted a third-party quality assurance program for the project to ensure that each mill's procedures were properly followed. The program was under the independent supervision of Microalloying International and J. P. Kenny metallurgists. The intensity of third-party quality supervision varied from mill-to-mill depending on the reputation and past performance of each mill. Judgements concerning the requisite level of manning were verified in pre-production discussions and during the initial stages of production and appropriate adjustments were made. The quality assurance surveillance ranged from simple monitoring of the manufacturers personnel to active inspection in other cases. Over 60 qualified staff were involved in monitoring/inspection activities. All quality assurance activities were under direct supervision of degreed metallurgists. After completion of production, a detailed close-out report was prepared for each mill in which all salient technical details and test records are permanently recorded.

Page	Paragraph	Line	Is:	Should Be:
	4			Add: The DOT requirements of 49 CFR Part 195 specify that a minimum of 10 percent of all welds be non-destructively tested, except at stream, lake, and reservoir crossings, railroad and public road ROW, overhead road crossings, within tunnels, pipeline tie-ins, and populated areas, where 100 percent of all welds must be inspected. AAPL has indicated they will comply with this requirement. The justification for non-destructively testing all welds at certain points pertains to the sensitivity of the particular location to an oil spill. This same protection should be afforded to other sensitive locations not explicitly covered by 49 CFR Part 195, and has been extended by a mitigation measure requiring 100 percent inspection of welds at any location determined by the Authorized Officer.
	6			Add: 4.2.1.2.3 Spills From Construction Equipment. The construction equipment and heavy machinery which will be used to build the pipeline require diesel fuel and other lubricants. Fueling and other vehicle maintenance on the construction line pose the risk of a fuel spill. However, most such spills are expected to be small and be readily detected. Construction crews on-site should be able to rapidly construct berms or other containment structures should a major spill occur. This should limit any potential damages to a very small geographic area. Spread of construction-related spills to water bodies will be prevented by prohibiting fueling and lubricating operations within 0.25 mile of water bodies (see Mitigation Measures, Section 4.7.1).
4-10	1	3-4	These data suggest... pipeline oil spills.	Delete
	1			Insert: Comparable statistics on oil spills compiled from the Office of Pipeline Safety and Operations oil spill reports covering the period 1970 to 1985 are provided in Table 4-3. Direct comparison of these tables is not possible, because the spill cause factors in the Office of Pipeline Safety and Operations reports do not precisely match those of Mastandrea (1982). However, both data sets suggest that there are three principal causes of pipeline failure:
	1	6	o Defective pipe	• Defective pipe or weld
	3	6-9	o Perimeter alarm system...and company personnel.	Delete entire bullet
	4	3	Oil pipeline spills...	Add: The methods by which this analysis is performed are outlined by Mastandrea (1982). To summarize, spill statistics are determined from the historical data base, and a "reference pipeline" is defined which describes the design characteristics of the average pipeline on which the spill statistics are based. Adjustments,

Page	Paragraph	Line	Is:	Should Be:
				or "correction factors", are then applied to the All American Pipeline to account for design differences or differences in operational practices which distinguish it from the reference line. Correction factors for some parameters (age, diameter, etc.) are given in the Mastandrea report. For design or operational differences not identified by Mastandrea (1982), best engineering judgement is applied to generate the correction factors.
				New paragraph: Data...
	Table 4-3a			See Modifications and Corrections Section 3.2.
4-15	5	5	1.367 barrels per mile-year	1.506 barrels per mile-year
	7	2	0.545 barrels per mile-year	0.601 barrels per mile-year
4-16	2	3	26,000 barrels	29,000 barrels
	2	5	3,400 barrels	3,750 barrels
	3	8	2,450 barrels	2,700 barrels
	6 (3rd bullet)	3-4	...The spill model calculates the block valve closure time given a specific rupture location.	...The spill calculations incorporate the estimated block valve closure time for a given rupture location.
4-17	Table 4-6			See Modifications and Corrections Section 3.2.
4-18	Table 4-7			See Modifications and Corrections Section 3.2.
4-19	Table 4-8			See Modifications and Corrections Section 3.2.
4-20	1	2	input to the model based on...	input to the spill volume calculation based on...
	2	2-5	route in Table 4-9. These calculations were...	route in Table 4-9. These volumes were estimated by Marmac Engineering following basic hydraulic principles.
	2	5	pipeline - specific factors.	Add: The spill volumes for the 30-inch diameter break were determined by estimating the volume of oil per minute that was being pumped in the line, times the number of minutes that elapsed before the block valve would be closed. For each spill location, the maximum upstream elevation and distance were determined. The distance was used to estimate the maximum oil volume that could be lost should the valve not be closed. The elevation slope was used to estimate the time required to drain the pipe and the rate at which oil flow from the rupture would decrease. In the case of remotely-operated valves, it was assumed that no appreciable reduction in flow occurred during valve closure. In reality, oil flow through the block valve would steadily decrease after the valve reached 75 percent closure. For the scenario where there was a 12-inch diameter hole, the same calculation methods were used except the oil losses were estimated using a standard formula for calculation of flow through an orifice. As oil was lost

Page	Paragraph	Line	Is:	Should Be:
				from the line, the decrease in static head would generate a similar reduction in differential pressure across the orifice, which in turn reduced the oil flow through the opening.
	2	11-13	sensitive crossings or by using... block valve.	sensitive crossings.
	2	14	sensitive river crossings in order to...	sensitive river crossings where response times exceed 1 hour.
	2	15	...these spill volumes (Section 4.7.1).	Add: Selection of which river crossings are sensitive is resource-specific, and the reader should consult the impact sections of the specific discipline.
	2			Add: The common response to a catastrophic occurrence consists of shutting down the pump station on the supply side of the rupture and adding full pumping capacity to the down side to create a suction on the rupture site, thus reducing the hydraulic head pressure. AAPL valve placement (design) and operational procedure supports this hydraulic model for reduction of large spills.
	4	2-3	...historical data on past spills reported to the Office of Pipeline Safety and Operations.	...historical data compiled from spill reports filed with the Office of Pipeline Safety and Operations for the period 1970 to 1985.
	4	8	are over $270,000. Most of the property damage (60 to 65 percent) is...	to the pipeline and adjacent property are over $270,000. Most of the damage (60 to 65 percent) is...
4-23	1	13	been taken from two sources: Radian Corporation (1986) and City of Austin (1986).	been taken from two sources: Radian Corporation (1986), City of Austin (1987), and the Texas Railroad Commission (1987).
	2	7	treated by land farming techniques. Surface water samples taken from nearby Slaughter Creek indicated that the creek had not been contaminated.	treated by land farming techniques. As of May 1987, 2,058 barrels had been recovered from the trenches. Surface water samples taken from nearby Slaughter Creek indicated that the creek had not been contaminated.
	4	1-7		Delete Insert: Five monitoring wells had been installed on site by May 1987. Locations are as follows: #1 (dry well) - 2,450 ft east-southeast of spill; #2 - 1,400 ft east of spill; #3 - 2,400 ft east-southeast of spill; #4 - 1,300 ft southeast of spill; and #5 (perched zone) - 1,300 ft southeast of the spill. The water levels in wells #2, 3, and 4 ranged from roughly 72 to 112 ft below ground surface (bgs), while the water level in well #3, which reportedly reflects perched conditions, was 33 ft (bgs). The four producing monitoring wells and four existing private wells had been sampled on a regular basis. Periodic groundwater sampling was expected to continue through spring 1988. Analyses for EPA 602 parameters (toluene and

Page	Paragraph	Line	Is:	Should Be:
				benzene family), xylenes, total hydrocarbons, and total organic carbons (TOC) indicated no detectable contamination in wells #2, 3, and 4; however well #5 in the perched zone showed the presence of hydrocarbons.
	5	1	As of mid-October 1986,...	As of May 1987,...
	5	5-6	measures, and the land surface was expected to recover within a short period of time.	measures, and the land surface was recovered to acceptable levels.
4-25	3			See Modifications and Corrections Section 3.3.
	4	1	4.2.1.4 Abandonment	4.1.2.5 Abandonment
	5	9	...or (3) rehabilitate the water source.	Add: Please refer to the Modifications and Corrections section for Appendix A, Section 1.4 for a discussion of health effects.
	6		Some components of the...of contaminated water could occur.	Delete
	7			Add: The migration of crude oil, degradation of water quality, and health effects are discussed in Modifications and Corrections Section 3.3 for Appendix A Sections 1.1 through 1.5.
4-28	1	6	and aquifers would be proportionally slower than that of water. Where	and porous media aquifers would be proportionally slower than that of water. Where
	1	8		Add: In fractured media associated with karstic terrain, movement of crude oil is likely to be at a faster rate than that in a porous media. In this case, oil may break up into globules in water and be entrained in underground caverns and crevices, where it would be immobilized.
	3	7-15	Even if the water table... described in Section 4.2.13.	Delete
	3	9-15	For example, the May 1986 occurrence of a 2,300-barrel oil spill from the Shell Rancho Pipeline in the Edwards Balcones Fault Zone Aquifer was contained on the surface and in shallow recovery trenches within a two week period (Radian 1986a). As of December 1986, there was no subsequent infiltration of oil to the water table detected in monitoring wells. This case study is described in Section 4.2.1.3.	Delete
4-29	1	10	channels.	Add: A more detailed discussion of the migration of crude oil in the subsurface can be found in the Modifications and Corrections section for Appendix A of the Draft SEIS, Sections 1.2 and 1.3.

Page	Paragraph	Line	Is:	Should Be:
	3	3	...complex geologic conditions.	Add: For example, a 2,300-barrel oil spill from the Shell Rancho Pipeline in the Edwards Balcones recharge zone occurred in May 1986. As of April 1987, there was no subsequent infiltration of oil to the water table detected in monitoring wells. However, the study was still ongoing at the time of this writing.
4-33	4			Add: The Proposed Route crosses three counties where the Carrizo-Wilcox Aquifer is the primary geologic unit that yields large and usable amounts of water. The Proposed Route crosses the northern section of Caldwell County, trending in a west-east direction. Towns that may be affected by an oil spill include Dale and Taylorsville. The Proposed Route crosses the southern corner of Bastrop County trending in a west-east direction. The only town that may be affected by an oil spill along this part of the route is String Prairie. The Proposed Route crosses the south-central section of Fayette County, trending in a northwest-southeast direction. Muldoon is the only town along this portion of the route which may be affected by an oil spill. Other water supplies that utilize the Carrizo-Wilcox Aquifer within these three counties that may be affected by an oil spill include livestock, irrigation, and domestic wells.
4-35	3	4	the stream.	the stream. A detailed description of the Brazos River crossing and scour depth is presented below. This crossing is expected to be representative of others in the eastern portion of the route. <u>Brazos River</u>: The Proposed Route crosses the Brazos River 10 miles downstream of Columbus in Fort Bend County. The USGS maintains a stream gauge at Richmond, approximately 15 miles upstream of the proposed crossing. Based on 66 years of record, the average flow in the river is 7,151 cfs. The maximum discharge recorded during that period was 123,000 cfs on June 6, 1929. The minimum recorded flow was 35 cfs on August 23, 1934. The river is classified as a meandering river with downstream progression of the meander bends. The proposed crossing is in a straight section of the river, and the crossing is stable laterally. The bed and banks consist of find grained alluvium. The median diameter of the bed material is estimated to be 0.13 millimeters. The estimated depth of scour is 15 ft. The Brazos River was selected as a site-specific example of the kind of scour that may occur. The estimated depth of burial of 15 ft is well within the capabilities of normal river crossing construction. Because the Brazos River is the largest river crossed along the route, the depth of scour on other rivers and streams is expected to be on the same order of magnitude or less. Refer to Tables 3-5a, 3-42a, and 3-58a in the Modifications and Corrections section for scour potential of other major streams crossed.

Page	Paragraph	Line	Is:	Should Be:
				Scour depth studies of certain stream crossings have been required in Mitigation Measure SS-4. AAPL has also indicated they will comply with applicable design codes and criteria regarding stream crossings. The BLM Authorized Officer will enforce compliance with these standards.
4-36	3			See Modifications and Corrections Section 3.3.
4-38	Table 4-12 (columns 3 & 4)	1	70 Llano	12 Junction
4-41	4	Last	evaporation,...physical dispersion.	Add: The migration of crude oil degradation of water quality and health effects are discussed in Modifications and Corrections Section 3.3 for Appendix A Sections 1.1 through 1.5.
4-43	Last	9		Add: To prevent potential damage to the Caverns, Mitigation Measure SS-3 avoids the use of explosives in trench excavation within 2 miles of the Caverns.
4-47	2	5	...not be significant.	Add: Significant impacts to soils would only occur if disturbed areas were not properly reclaimed.
	3	4	...would result in significant impacts...	...would not result in significant impacts...
4-54	1	5	...The recovery period has been several months for benthic macroinvertebrates...	...The recovery period usually is about two to three months for macroinvertebrates...
	1	7	(Cheremisinoff and Morresi 1977).	Add: However, benthic macroinvertebrate populations in small streams have taken more than two years for complete recovery (Harrell 1984).
	2	6	...and one to three years for invertebrates and fish.	Add: ...and less than one to greater than five years for invertebrates and fish (Anderson et al. 1985; Weff et al. 1981; Hampson and Moul 1978; Thomas 1977; Straughan 1977).
	3	1	Toxicity studies using water soluble fractions in crude oil...	Although toxicity information is available for a limited number of fish species and families, studies using water soluble fractions in crude oil...
	4	5	...backwater areas such as South Llano River, Chocolate Bayou, Mustang Bayou, ...	...backwater areas such as Chocolate Bayou, Mustang Bayou, ...
	4	7-10	major sensitive area. Freshwater habitat in the other streams listed in Table 4-15 also could be affected but their high flows, large volumes, and lack of back-water areas would likely limit the magnitude of the impact.	major sensitive areas. Freshwater habitat in the other streams in Table 4-15 (South Llano, Pedernales, Colorado, and Brazos Rivers) also could be affected but their relatively moderate to high flows, moderate to high volumes, and lack of backwater areas would likely limit the magnitude of the impact.
	4	11	Table 4-17,...	Table 4-16,...

Page	Paragraph	Line	Is:	Should Be:
	4	12	...species occurring in these streams.	...species occurring in Lake Travis and the Colorado and Brazos Rivers. Of the other important species with toxicity information, the sunfish family, as indicated by the bluegill, would appear to be moderately sensitive.
			If affected, fish populations should recover within several months to about two years depending upon the damage to eggs and juveniles.	If affected, impacts to aquatic communities should recover within several months to slightly more than two years (Baca et al. 1985; Harrell 1985; EPA 1982; Palm et al. 1979; Alaska Pipeline Company 1979). The longer recovery time would be associated with standing water environments (Baca et al. 1985).
4-57	2	16-18	If affected, marine communities would recover within several months to about three years.	If affected, marine communities would recover within several months to greater than five years (Anderson et al. 1985; Webb et al. 1981; Hampson and Moul 1978; Thomas 1977; Straughan 1977).
	2	18	...years.	Add: Studies in coastal marshes have shown that recovery can exceed three years (Hampson and Moul 1978; Teal et al. 1978; Baca et al. 1983).
4-61	2	11	This loss is considered a significant impact.	This loss to the riparian type is considered a significant impact.
4-62	2	4		Add: Mitigation Measure LU-3 provides for the installation of temporary fences to protect the animals and to prevent their escape.
	5	5	fishhook cactus occurs across portions of the routes. Nine known	fishhook cactus occurs across portions of the routes. Field surveys of the route located no habitat or individuals for either species. Nine known
4-63	3	1	...57...	...47...
	3	14-17	However, specific habitat surveys may be required at the Refuge and near Tavener as part of the Section 7 Consultation to determine if the ROW actually crossed prairie chicken habitat in these areas or occurred near any breeding complexes.	Field surveys completed in March 1987 found that no habitat or individuals would be affected by the proposed construction.
	5	1	Eighteen...	Eleven...
	6	1	Thirteen...	Six...
	6	2	...(3 turtles, 1 lizard, and 9 snakes).	...(3 turtles, 1 lizard, and 2 snakes).
4-64	2	1	Two birds also received a rating of 3, including the black-capped vireo, a federal candidate Category 1 species (sufficient data available for listing as threatened or endangered).	Two song birds also received a rating of 3, including the black-capped vireo, a proposed federally endangered species.

Page	Paragraph	Line	Is:	Should Be:
	4	1	Eighteen...	Sixteen...
	4	3	...18 species...	...17 species.
4-67	3	7	water aquifer that feeds these springs via Onion Creek (see Appendix C).	water aquifer that feeds these springs via Onion Creek (see Final SEIS Appendix B, Onion Creek to Edwards Aquifer Oil Spill Scenario).
	4	2	Appendix C concludes...	Appendix B in the Final SEIS concludes...
4-68	1	4-5	coastal least tern (state threatened),	Delete
	1	7-8	If a major spill...could be affected.	Delete
	1	15	and osprey (state threatened)	Delete
4-69	2	4-5	It is not expected that any special status bird would re-use pipe-line habitats...	Delete
4-70	2	2-15	36 CFR 800.5	36 CFR 800.9
4-73	2	3		Add: Barton Springs and Barton Springs Pool in Zilker Park in Austin could be significantly affected by an oil spill in the Edwards Aquifer.
4-74	1	6	...issued for SO_2, NO_2, TSP, CO, and...	...issued for SO, NO_2, TSP, CO, Pb, and...
4-79	4	2	pump/heater station are shown in Table 4-26 for SO_2, NO_x, and TSP.	pump/heater station are shown in Tables 4-26 and 4-26a for SO_2, NO_x, and TSP for both oil flow volumes.
4-83	Table 4-26	4		Add: (300,000 BPD)
	Table 4-26a			See Modifications and Corrections Section 3.2.
4-84	2	1	The short-term modeling results are shown in Table 4-27.	The short-term modeling results are shown in Tables 4-27 and 4-27a for both oil flow volumes.
	2	5	maximum. These results...	maximum or apportioned to the appropriate averaging period.
	5	1	The 300,000 BPD of crude oil	The crude oil
4-85	Table 4-27	4		Add: (300,000 BPD)
	Table 4-27a			See Modifications and Corrections Section 3.2.
4-88	Table 4-30			See Modifications and Corrections Section 3.2.
4-94	Table 4-32			See Modifications and Corrections Section 3.2.
4-102	1	6	...springs, rivers, or reservoirs.	Add: If an oil spill were to occur, there could be impacts on municipal and rural water supplies which would constitute socioeconomic impacts (see Section 4.2.2).
4-107	5	11	...from Station 4 at Seguin that would...	...from Station 4 at Seguin. The first would...

Page	Paragraph	Line	Is:	Should Be:
	5	13	...the project. Actual noise...	...the project. The second could be impacted by long-term noise levels in excess of 65 dBA. These would be considered significant noise impacts, although actual noise...
4-108	3	2	1.367 barrels per mile-year	1.506 barrels per mile-year
	3	6	29,000 barrels	34,000 barrels
	3	8	3,400 barrels	3,750 barrels
4-109	Table 4-37			See Modifications and Corrections Section 3.2.
4-110	Table 4-38			See Modifications and Corrections Section 3.2.
4-113	8			Add: The Milam County portion of the Northern Alternative has an estimated total length of 30 miles. This part of the pipeline crosses the central to west-central portion of the county, trending in a north-south direction. The primary geologic unit that yields usable amounts of water along this part of the route consists of the Carrizo-Wilcox formation. The municipal water supplies that may be affected by an oil spill include the Cities of Rockdale and Minerva. The map of Milam County taken from the Texas Water Department Board Report No. 195 identifies selected wells within 2 miles of this portion of the route. There exist domestic and livestock wells along the Northern Alternative that are not indicated on the map. The Burleson County portion of the Northern Alternative has an estimated total length of 12 miles. This part of the pipeline crosses the extreme western edge of the county, trending in a north-south direction. The geologic units that yield usable amounts of water along this part of the route consists of the Queen City Sand, Sparta Sand, and the Carrizo-Wilcox Group. The principal water-bearing unit in this area of the county is the Carrizo-Wilcox Aquifer. There are no municipal water supplies in this area of the county, but there exist domestic and livestock wells along this route that may be affected by an oil spill.
4-118	2	2	proposed Shell Oil Milam coal mine northeast of Rockdale. The presence	proposed Milam lignite mine northeast of Rockdale. The presence
	3	2	extraction activities adjacent to the Orchard Dome in Fort Bend County.	extraction activities adjacent to the Orchard Dome oil field in Fort Bend County.
	9	5	not be significant.	Add: Significant impacts to soils would only occur if disturbed areas were not properly reclaimed.
4-125	3	7-8	....would recover within several months to about three years.	...would recover within several months to about 5 years.

Page	Paragraph	Line	Is:	Should Be:
	6	8	This loss is considered a significant impact.	This loss to the riparian type is considered a significant impact.
4-127	3	1	...53...	...43...
	3	13-16	miles from the pipeline). However,... near any breeding complexes.	miles from the pipeline). Specific habitat surveys located prairie chicken habitat south of Sealy in Austin County and southeast of Orchard in Fort Bend County. Mitigation Measure TB-10 is a conservation measure for these habitats.
	4	9-13	there. Exact alignment at the Colorado River could reduce impacts to this species (impacts would be greatest in shallow riffles and least in deep water). It is possible that construction in a riffle area would reduce numbers of this species, but should not jeopardize the population.	Delete
	4	18		Insert: Construction could impact the snake by habitat disturbance, crushing by equipment, or blasting. Mitigation Measure TB-9 in the Final SEIS provides conservation measures for the Concho water snake.
	6	1	Seventeen...	Ten...
	6	3	Twelve...	Five...
4-128	1	1	...(2 turtles, 1 lizard, and 9 snakes)...	...(2 turtles, 1 lizard, and 2 snakes)...
	1	4	...a federal candidate Category 1 species.	...a proposed federally endangered species.
	2	1	Fifteen...	Thirteen...
	2	3	...17...	...16...
4-131	3	1	In summary, the construction... ...emissions over the Proposed Route.	"Although the additional pump/heater station and 60 miles of pipe would result in an increase in total project emissions over the Proposed Route, the construction and operations air quality impacts for the Northern Alternative are not considered significant.
4-135	Table 4-47			See Modifications and Corrections Section 3.2.
4-140	5	2	1.367 barrels per mile-year	1.506 barrels per mile-year
	5	6	29,400 barrels	32,400 barrels
	5	8	3,400 barrels	3,750 barrels
4-141	Table 4-49			See Modifications and Corrections Section 3.2.

Page	Paragraph	Line	Is:	Should Be:
4-142	Table 4-50			See Modifications and Corrections Section 3.2.
4-151	3	5	not be significant.	Add: Significant impacts to soils would only occur if disturbed areas were not properly reclaimed.
4-156	Table 4-57			See Modifications and Corrections Section 3.2.
4-157	1	12	...should recover within several months to three years.	...should recover within several months to five years.
4-159	2	3-4	Southern Alternative ROW. However, as discussed in Section 3.4.7, potential habitat for Texas snowbells (federal endangered) occurs across	Southern Alternative ROW. Site surveys in April 1987 did not locate Texas snowbells nor its habitat (federal endangered) across
	3	1	...64...	...54...
	3	2-11	potentially occurring along the Southern Alternative, only one species,... near any building complex	potentially occurring along the Southern Alternative, none are receiving the highest impact rating of 1. Field surveys and interviews with local experts established that no Attwater's greater prairie chicken habitat occurs along the Southern Alternative.
	5	1	Twenty-four...	Seventeen...
4-160	1	1	Eighteen...	Eleven...
	1	2-3	...(2 amphibians, 3 turtles, 1 tortoise, 2 lizards, and 10 snakes).	...(2 amphibians, 3 turtles, 1 tortoise, 2 lizards, and 3 snakes).
	1	6	...federal candidate Category 1...	...proposed federally endangered species...
	2	1	Eighteen...	Sixteen...
	2	3	...19...	...18...
4-163	6	1	In summary, the construction... ...project emissions over the Proposed Route.	"Although the additional pump/heater station and 52 miles of pipe would result in an increase in total project emissions over the Proposed Route, the construction and operations air quality impacts for the Southern Alternative are not considered significant.
4-168	Table 4-60			See Modifications and Corrections Section 3.2.
	Table 4-61a			See Modifications and Corrections Section 3.2.
	Table 4-61b			See Modifications and Corrections Section 3.2.
4-172	Section 4.5			See Modifications and Corrections Section 3.3.
4-174	3	11		Add: Stacy Dam was considered in the cumulative impacts.
				The AAPL ROW realignment was to reduce conflicts with the Stacy Dam and Reservoir; therefore, the new alignment was placed 30 miles downstream. the only potential cumulative impact between

Page	Paragraph	Line	Is:	Should Be:
				these two projects is the possible impacts on the Concho water snake. Constructional and operational impacts from the Stacy Dam and Reservoir are significant for the Concho water snake. A potential oil spill during operation from the All American Pipeline could have significant downstream impacts on the Concho water snake, and combined with the Stacy Dam and Reservoir, extenuate the loss of the Concho water snake population.
	Table 4-61c			See Mitigation Measure SS-1 in Final SEIS Appendix A.
4-176	Table 4-62			See Mitigation Measure SS-2 in Final SEIS Appendix A.
4-197	Table 4-63			See the end of Final SEIS Appendix A.
4-202	Table 4-64			See the end of Final SEIS Appendix A.
4-204	5	2	...(federal endangered)...	...(federal threatened)...
4-207	Table 4-65			See the end of Final SEIS Appendix A.
A-1	6			Add: Sections 1.1 through 1.5; see Modifications and Corrections Section 3.3.
A-3	4	2	content.	Add: Pipe specifications also call for assistance to hydrogen-induced cracking and sulfide stress cracking.
	4	3	by 75 percent.	by 50 percent.
	4	5	23.3 percent...	15.5 percent...
	4	6	Correction Factor = 0.768	Correction Factor = 0.845
A-4	4	5	Assume the decrease in the internal corrosion rate is...	Assume the decrease in the failure rate due to internal corrosion rate is...
A-6	3	3	1. Monitoring oil to limit H_2O and H_2S - 0.768	1. Monitoring oil to limit H_2O and H_2S - 0.845
	3	6	Composite Factor = 0.701	Composite Factor = 0.772
	6	2	Leaks = (0.392)(0.701) = 0.275 barrels per mile-year	Leaks = (0.392)(0.772) = 0.303 barrels per mile-year
	6	3	Ruptures = (2.40)(0.701) = 1.682 barrels per mile-year	Ruptures = (2.40)(0.772) = 1.853 barrels per mile-year
A-8				See Modifications and Corrections Section 3.3.
A-9	Section 2.4			See Modifications and Corrections Section 3.3.
A-15	Table A2-4			See Modifications and Corrections Section 3.2.
B-1	2	8	procedures are developed.	Add: Updates are planned every 12 months.
	3	4		Add: Oil Spill Contingency Plan will be reviewed and approved by BLM's Authorized Officer, Texas Water Commission, EPA, and other agencies. It is the intent of this

Page	Paragraph	Line	Is:	Should Be:
				preliminary Oil Spill Contingency Plan to be the basis of the actual plan to be prepared by AAPL. In conformance with Mitigation Measure SS-1, key elements of this plan are being included by AAPL before the approval by the Authorized Officer. And thus, modifications and corrections incorporated herein through comments from the Draft SEIS are to be addressed by AAPL in the final plan.
B-8	1	2	...spilled oil is satisfactorily contained and...	...spilled oil is contained and...
	2	6	Cooperative equipment.	Cooperative equipment. Training will be conducted once per year to ensure up-to-date methods are incorporated and to maintain full expertise for the response team.
B-14	4	2	Associated with movement of crude oil into and out of storage tanks.	Associated with movement of crude oil into and out of the pipeline and storage tanks.
	5	Last	transfer inputs, and pipeline leak detection, alarming, and shutdown.	transfer inputs, and pipeline leak detection, alarming, and shutdown. BLM will require backup communication systems should the primary system fail in accordance with Mitigation Measure SS-6.
B-15	3			See Modifications and Corrections Section 3.3.
B-26	1			Add before Section 3.1: AAPL will provide immediate response within one hour of time of notification. That response will include adequate personnel, specialized equipment, and supplies to treat the leak or spill. The equipment and supplies provided will be equal to the largest and next largest stream crossing oil spill requirements for oil spills of 10,000 to 20,000 barrels. Equipment will be packaged in a manner to provide rapid transport to the site. Most of the equipment will be stored in trailers to allow rapid and efficient transport. Equipment stored will include a variety of items including communications equipment, booms, skimmers, pumps, hoses, pipes, nozzles, absorbents, storage devices, weed eaters, hand tools, protective equipment, and other necessary pieces. The following discussion includes containment techniques and procedures, and cleanup techniques and procedures.
B-31	4			Add: Booming is generally ineffective for containment of oil in rapid currents. In such conditions, the standard procedure is to allow the oil slick to move downstream until it reaches calmer waters where containment activities are more effective. The decision on use of booming in specific circumstances will be made by the on-scene Oil Spill Coordinator.

Page	Paragraph	Line	Is:	Should Be:
B-40	Last	Last		Add: • Dispersant and other chemicals • No Action
B-41	1	1-2	Dispersants would not be used for cleanup of spilled oil. EPA does not allow the use of dispersants for oil cleanup in the United States.	Dispersants would only be used for cleanup of spilled oil if no other suitable techniques were available. Should dispersant use be required, approval from EPA would be obtained in advance. AAPL does not anticipate circumstance would occur which would require application of dispersants.
B-43	4			Insert: 3.2.7 Dispersants and Other Chemicals. Dispersants and other chemicals have the capability to change the hyprophobic characteristic of oil, allowing it to disperse in water or settle to the bottom. This can cause toxicity or other problems to aquatic organisms and other water users such as municipal water supplies. This technique should not be normally used. Only the on-site coordinator with the concurrence of the Texas Water Commission can authorize the use of dispersants. Dispersants have been used in a limited manner to protect surface water resources, such as large flocks of birds where the risk of contamination to other resources, such as shell fish or aquatic organisms is of lesser concern.
	4		3.2.7	3.2.8
	5		3.2.8	3.2.9
	6		3.2.9	3.2.10
	7		3.2.10	3.2.11
	7	2	3.2.10.1	3.2.11.1
B-47	2	1	3.2.10.2	3.2.11.2
B-49	2	1	3.2.10.2.1	3.2.11.2.1
	4	1	3.2.10.3	3.2.11.3
B-50	2	1	3.2.10.3.1	3.2.11.3.1
	3	1	3.2.10.3.2	3.2.11.3.2
B-51	1	1	3.2.10.3.3	3.2.11.3.3
	2	1	3.2.10.3.4	3.2.11.3.4
	3	1	3.2.10.3.5	3.2.11.3.5
	5	1	3.2.11	3.2.12
	7			Add: 3.2.13 No Action In some cases, the action taken to remove oil may cause damage greater than that of the oil itself. In these circumstances, the appropriate course of action is to leave the oil in place.

Page	Paragraph	Line	Is:	Should Be:
B-53	1	3		The final Oil Spill Contingency Plan will demonstrate the technology required for containment and removal of spilled oil. These plans will include specifications on manpower, equipment, and supply resources needed and where they will be obtained. The plan will provide information on access, location for boom anchorage, potential containment areas, existing structures which might aid in retaining oil (e.g., dams, flat bodies of water). Plans without the goals are rapid containment, effective cleanup, and minimum disruption to the existing environment. The site-specific contingency plans will be prepared for sensitive areas before pipeline operation. These areas represent important resources vulnerable to oil contamination. Table B4-1a lists the location and a brief summary of resources at risk. A more detailed list of resources may be required by the Authorized Officer at the time of the Oil Spill Contingency Plan finalization. This would be necessary at areas with high value resources, but where the existing data base is currently limited or where the list of resources is too extensive to provide the accurate comprehensive list at this time. Sensitive receptors and resources include groundwater wells for municipalities; surface water intakes of reservoirs and streams for municipalities; irrigation companies; important ecological features such as breeding bird colonies, spawning areas for fish and shell fish; recreational resources such as marinas; and cultural resources and other resources.
	Table B4-1a			See Modifications and Corrections Section 3.2.
B-64	1	6	provided by the closest...	provided by AAPL with containment support from the closest...
B-65	4	2	...a fiber optics system laid with the pipeline and/or...	Delete
	5	1	Fire fighting training would...	Fire fighting training for AAPL personnel would...
	5	10	departments and the pipeline companies.	departments.
	5	11	part of the fire protection...	part of the All American Pipeline fire protection...
B-66	1	2-3	This is particularly...type of emergency.	Delete.
E1-1	Table E1-1			See Modifications and Corrections Section 3.2.
E1-10	Table E1-4			See Modifications and Corrections Section 3.2.
E1-14	Table E1-5			See Modifications and Corrections Section 3.2.

Page	Paragraph	Line	Is:	Should Be:
E1-18	Table E1-6			See Modifications and Corrections Section 3.2.
E1-23	Table E1-7			See Modifications and Corrections Section 3.2.
E2-4	4	1	Twenty-three...	Twenty-two...
	4	4	...12 birds...	...11 birds...
	5	1	FC1. The only FC1 species...	The only proposed federally endangered species...
	5	1-8		Move entire paragraph to Page E2-3 following paragraph 5: "The juguarundi...riparian vegetation.
E2-5	5	2	(southeastern bat, swift fox, Louisiana black bear)...	Delete: Louisiana
	7	2	...13 species...	...14 species...
	7	4-5	...federally threatened or endangered, and...	...federally threatened, endangered, or candidate species, and...
	8	1	Twenty-five...	Seventeen...
	8	3	The San Marcos salamander, green sea turtle, loggerhead sea turtle, Fern Bank salamander, gray-banded kingsnake, reddish egret, American swallow-tailed kite, Swainson's Hawk, southeastern bat, and golden-cheeked warbler...	The San Marcos salamander, green sea turtle, loggerhead sea turtle, alligator snapping turtle, reddish egret, American swallow-tailed kite, Arctic peregrine falcon, piping plover, black-capped vireo, Bachman's sparrow, and golden-cheeked warbler...
E2-6	1	1	The remaining 15 species include 1 amphibian, 8 reptiles, and 6 birds.	The remaining 5 species include 1 reptile and 4 birds.
	1	2-3	The Rio Grande...Houston area.	Delete.
	1	7-9	Seven snakes...all of them.	Delete.
	2	1	Six...	Four...
	2	2	The white-faced ibis, coastal least tern, and wood stork...	The white-faced ibis and wood stork.
	2	4-5	Ospreys...or reservoir.	Delete.
E2-8	6	1	Twenty...	Nineteen...
	6	3	...12 birds,...	...11 birds,...
	7	1	FC1. The only FC1 species...	The only proposed federally endangered species...
E2-8 and E2-9	7	1-8		Move entire paragraph to follow: The jaguarundi. riparian vegetation. On page E2-8.
E2-9	5	2	(southeastern bat, swift fox, Louisiana black bear) are at the piriphery	Delete: Louisiana
	6	5	...may now be extinct.	...may now be extinct in Texas.

Page	Paragraph	Line	Is:	Should Be:
E2-12	4	1	Twenty-seven...	Twenty-six...
	4	3	...12 birds,...	...11 birds,...
	5	1	FC1. The only FC1 species...	The only proposed federally endangered species...
	5	1-8		Move entire pargaraph to page E2-11 following paragraph 5: "Ocelotts...major rivers."
E2-13	4	2	(southeastern bat, swift fox, Louisiana black bear) are at the periphery	Delete: Louisiana.
	7	1	Thirty-two...	Twenty...
	7	2-7	The Valdina Farms salamander, Comal blind salamander, black-spotted newt, Rio Grande lesser siren, reticulate collared lizard, green sea turtle, loggerhead sea turtle, Fern Bank salamander, gray-banded kingsnake, reddish egret, American swallow-tailed kite, Swainson's hawk, southeastern bat, and golden-cheeked warbler...	The Comal blind salamander, reticulate collared lizard, green sea turtle, alligator snapping turtle, Casrade Caverns salamander, reddish egret, American swallow-tailed kite, Arctic peregrine falcon, piping plover, black-capped vireo, Bachman's sparrow, and golden-cheeked warbler...
E2-14	2	1-2	The remaining 18 species include 1 amphibian, 10 reptiles, and 7 birds.	The remaining eight species include three reptiles, and five birds.
	2	2-4	The Rio Grande...Houston areas.	Delete.
	2	7	Eight snake species are...	One snake species is...
	2	8-9	Exact locations of these species are unknown, but the pipeline is expected to cross habitats used by all of them.	Exact locations of the Texas indigo snake are unknown, but the pipeline is expected to cross habitats used by it.
	3	1	Seven...	Five...
	3	2	The white-faced ibis, coastal least tern, and wood stork...	The white-faced ibis and wood stork...
	3	4-5	Ospreys...or reservoir.	Delete.
E2-17	Table E2-2			See Modifications and Corrections Section 3.2.
E2-30	Table E2-6			See Modifications and Corrections Section 3.2.
E2-38	Table E2-7			See Modifications and Corrections Section 3.2.
F-2	Table F-1			See Modifications and Corrections Section 3.2.
G-1	Table G-1			See Modifications and Corrections Section 3.2.

3.2 NEW AND REVISED TABLES AND FIGURES

Section 3.2 presents complete tables and figures, including: (1) tables and figures revised from the Draft SEIS and (2) new tables and figures added to the Final SEIS. All of the tables are presented first in numerical order followed by the figures in numerical order.

REVISED TABLE 1-1

KEY AUTHORIZING ACTIONS

Agency	Statutory Authority	Description	Project Facilities
FEDERAL			
Department of Commerce			
National Marine Fisheries Service	Section 7 of Endangered Species Act.	Issue Biological Opinion on threatened or endangered marine mammals for all federal actions.	All project facilities
Department of Defense			
Army Corps of Engineers	Section 404 of the Federal Water Pollution Control Act of 1972 (33 USC 1344).	Issue nationwide and individual permit(s) for placement of dredged or fill material in waters of the U.S. or their adjacent wetlands.	River or stream crossings for pipeline or access roads
	Section 10 of the River and Harbor Act of 1899 (33 USC 403).	Issue permit(s) for structures or work in or affecting navigable waters of the U.S.	Water diversion facilities, and construction resulting in alterations to water courses
Department of Interior			
Bureau of Land Management	Civil Action No. A-86-CA-141 in the U.S. District Court for the Western District of Texas, Austin Division.	Prepare SEIS and issue Record of Decision.	All project facilities
Fish and Wildlife Service	Section 7 of Endangered Species Act.	Issue Biological Opinion on threatened or endangered species of fish, wildlife, or plants for all federal actions.	All project facilities
Department of Transportation	Section 6, 80 Stat. 937; 18 USC 831-835, 40 USC 1655; Hazardous Liquid Pipeline Safety Act of 1979.	Compliance with 49 CFR Part 195, Transportation of Liquids by Pipeline.	Pipeline construction and operations
Federal Communications Commission	47 USC 154, 303.	License to operate industrial radio service.	Emergency communications
Federal Energy Regulatory Commission	Section 6 of the Interstate Commerce Act.	Operations and tariffs.	Pipeline operations
Environmental Protection Agency	Title 40 CFR, Part 112	Spill Prevention Control and Counter Measure Plan	Pipeline operations

REVISED TABLE 1-1 (CONTINUED)

Agency	Statutory Authority	Description	Project Facilities
STATE OF TEXAS			
Air Control Board	Texas Clean Air Act of 1967.	Issue permits for construction and operation of pump stations.	Air emissions from heaters at pump stations
General Land Office	Article XIV of the 1876 Texas Constitution, Texas Natural Resources Code.	Issue easements to cross state lands.	Pipeline, access roads, power lines
Highway Department	Texas Natural Resources Code.	Issue permit to cross federal-aid and state highways.	Pipeline and access roads
Parks and Wildlife Department	Texas Parks and Wildlife Code.	Issue permit for removal or disturbance of public stream or bay bottom materials; including sand, shell, gravel, and marl.	Pipeline stream crossing
Railroad Commission	Texas Natural Resources Code (Title 3).	Permit to operate a crude oil pipeline.	Pipeline operation
State Historic Preservation Office	Antiquities Code of Texas, Texas Natural Resource Code (Title 9).	Reviews cultural resource mitigation for completeness.	All project facilities
Texas Water Commission	Texas Water Code (Chapter 16).	Issue permit to construct along or near any stream of the state subject to floods or overflows.	All project facilities
Water Quality Board	Texas Water Code (Chapter 26).	Issue NPDES permit for wastewater discharge to state waters.	Discharge of hydrostatic test water
COUNTY			
Drainage Districts	Texas Natural Resources Code.	Issue permit to cross drainages.	River or stream crossings for pipeline or access roads
OTHER AGENCIES			
River Authorities	1876 Texas Constitution, Texas Natural Resources Code.	Issue permit to cross streams, canals, and rivers.	River or stream crossings

REVISED TABLE 2-6

APPLICABLE CODES, STANDARDS, AND GUIDELINES

	ANSI B31.3	ANSI B31.4	API 1110	API 1104	API 5L	API 6D	NFPA 30	NFPA 70	RP-01-69	49 NACE 195	UBC CFR Zone	for A58.1	ANSI AISC
Pipeline		X		X	X					X			
Pipeline Valves						X				X			
Pipeline Valve Locations		X								X			
Hydrostatic Testing		X	X							X			
Pumps										X			
Pump Station Piping		X	X							X			
Pump Station Valves						X				X			
Pump Station Layout		X					X				X		
Corrosion		X								X			
Pressure Relief		X								X			
Cathodic Protection		X							X	X			
Security		X								X			
Heaters	X										X	X	X
Scraper Launch and Rec.		X								X	X		
Structures and Buildings								X			X	X	X
Oil Spill Contingency Plan										X			

Legend

American National Standards Institute (ANSI) B31.3 Petroleum Refinery Piping

Prescribes minimum requirements for materials, design, fabrication, assembly, test, and inspection of petroleum refinery pressure and vacuum systems. Covers all piping within the property limits of a refinery, loading terminal, bulk plant, compounding plant, or refinery tank farm.

ANSI B31.4 Liquid Petroleum Transportation Piping System

Prescribes minimum requirements for piping transporting liquid petroleum such as crude oil, condensate, natural gasoline, natural gas liquids, and liquid petroleum products between producers, lease facilities, tank farms, gas processing plants, refineries, stations, terminals, and other delivery and receiving points.

API 1110 Recommended Practice for Pressure Testing of Liquid Petroleum Pipelines

Recommendations for procedures to be used during hydrostatic testing of liquid pipelines.

API 1104 Standard for Welding Pipelines and Related Facilities

Covers welding of piping used in compression, pumping, and transmission of crude petroleum, petroleum products, and fuel gases, and to applicable distribution systems. Also details qualifications, testing, and inspection of piping welds, including radiographic procedures.

API 5L Specification for Line Pipe

Specification covers material, design, fabrication, assembly, and testing requirements for line pipe intended for service in petroleum, petroleum product, and natural gas pipelines.

API 6D Specification for Pipeline Valves

Specification covers material, design, fabrication, assembly, and testing requirements for valves intended for service in petroleum, petroleum product, and natural gas pipelines.

National Fire Protection Association (NFPA) 30 Flammable & Combustible Liquids Code

Prescribes minimum standards of design and operaton of equipment and facilities employed in the storage, handling, and processing of flammable and combustible liquids.

National Fire Protection Association (NFPA) 70 Electrical Code

This code prescribes minimum standards of design and construction of power, lighting control and communication equipment wiring and installation in hazardous and non-hazardous locations.

National Association of Corrosion Engineers (NACE) Criteria RP-01-69

This code specifies minimum standards for cathodic protection systems.

Title 49, Code of Federal Regulations (49 CFR) Transportation

The governing Code for the U.S. Department of Transportation, parent organization of the Office of Pipeline Safety. Parts 192 and 195 of the regulation relate to gas and oil piping, respectively, and outline the minimum requirements for materials, design, fabrication, assembly, construction, operation, inspection, testing, and maintenance of pipelines transporting or storing hazardous gases and/or petroleum and allied products.

Uniform Building Codes (UBC) (International Conference of the Building Offices)

Sets forth minimum standards for materials, design, and construction of buildings and appurtenant structures. Has no intrinsic authority, but is generally incorporated into local building regulations which do have force of law. Section 73 prescribes procedures for wind and earthquake design.

ANSI A58.1 Minimum Design Loads for Buildings and other Structures

Similar to Section 23 of the Uniform Building Codes, but provides more detailed procedures for wind and snow load design. Earthquake design procedures are virtually identical to UBC.

American Institute of Steel Construction (AISC)

The AISC publishes a number of specifications and recommended practices, the most notable of which are:

- Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings
- AISC Code of Standard Practice
- Specification for Structural Points using ASTM A325 or A490 Bolts

These specifications are updated at regular intervals and are frequently incorporated into law by reference. AISC standards have been accepted as definitive by the steel industry and the engineering profession for many years.

REVISED TABLE 2-9

MAINLINE BLOCK AND CHECK VALVES

NORTHERN ALTERNATIVE

Location	Approx. Mile Post	Remote-Control Block Valve	Manual Block Valve	Check Valve
McCamey Station #1	0	1		1
	25		1	
	49		1	
Pump Station #2	75	1		1
South Concho River	102		1	1
	129		1	
Colorado River	158		1	1
Pump Station #3	166	1		1
	190		1	
	211		1	
	231		1	
Pump Station #4	248	1		1
Leon River	274		1	1
	292		1	
	315		1	
Pump Station #5	340	1		1
Little River	345		1	1
	354		1	
Middle Yegua Creek	382		1	1
	402		1	
Pump Station #6	423	1		1
	442		1	
	456		1	
	474		1	
Brazos River	480		1	1
Clear Creek	507	1		1
Webster Station	509	1		
Texas City Lateral	0 (Texas City)	1		
Texas City Station	33 (Texas City)	1		
Total		10	19	13
GRAND TOTAL				42

TABLE 2-10a

EXISTING CRUDE OIL PIPELINES IN THE VICINITY OF MIDLAND AND MCCAMEY, TEXAS

System Name	Destination or Pipeline Junction	Diameter (inches)	Approximate Capacity[1] (1,000 BPD) 10 pounds per square inch	Approximate Capacity[1] (1,000 BPD) 15 pounds per square inch	Approximate Length from Midland/McCamey to Distination (miles)
Amdel	Port Arthur, TX	10	26.4	33.0	540
American Petrofina	Corpus Christi, TX	10	26.4	33.0	410
Amoco	Cushing, OK	16/16	160.0	200.8	540
Basin	Cushing, OK	22	197.0	258.0	550
Exxon	Corpus Christi, TX	12	42.7	53.7	370
Exxon	Houston, TX	18	125.0	140.0	460
Mesa/W. Texas Gulf	Port Arthur, TX	24/26	312.0	395.0	580
Mobil	Corsicana, TX	12/16	166.4	207.8	400
Phillips	Borger, TX	12	42.7	53.7	340
Rancho	Houston, TX	24	250.0	316.0	450
Shell	Cushing, OK	10	26.4	33.0	480
Texas-New Mexico	Houston, TX	12	42.7	53.7	440
TOTAL			1,417.7	1,777.7	5,560

Source: Modified from BLM and Los Angeles Harbor Department 1985.

[1]Based on no elevation change, whereas all destinations are downhill, except for Borger.

REVISED TABLE 2-12

COMPARISON OF SIGNIFICANT IMPACTS[1], CONCERNS, AND HAZARDS FOR THE PROPOSED ALL AMERICAN PIPELINE AND ALTERNATIVES

Code[2]	Proposed Route	Northern Alternative	Southern Alternative
General			
C Linear miles (acres) of land	486 (5,887)	546 (6,615)	538 (6,518)
System Safety			
C Expected number of spills in 40 years	7.8 (0.041)[3]	8.8	8.6
C Average spill volume	3,350 barrels (2,400 barrels)[3]	3,350 barrels	3,350 barrels
S ROW crosses areas sensitive to an oil spill	Yes	Yes	Yes
Groundwater			
S Number of sensitive aquifers potentially affected	7	6	5
S Miles of sensitive aquifers potentially affected	404	332	418
C Number of municipal groundwater supplies within 2 miles of route	9	7	10
Surface Water			
C Number of perennial stream crossings	11	8	15
C Number of intermittent stream crossings	82	108	100
C Number of downstream reservoirs	2	7	4
S Number of rivers with municipal water supplies crossed	3	9	9
Geology			
H Number of active surface faulting/ subsidence areas crossed	1	1	1
S Number of active or proposed mining operations crossed	0	2	0
H Number of potentially unstable slope areas crossed[4]	1	5	9
S Number of unique geologic areas	1	0	0
H Number of karst areas	1	0	2
C Miles of slopes >15 percent	17	13	30
Soils			
C Miles of sensitive soil units crossed[5]	477	496	472

REVISED TABLE 2-12 (CONTINUED)

Code[2]	Proposed Route	Northern Alternative	Southern Alternative
Aquatic Biology			
S Number of streams crossed with important fish populations	10	16	20
S Number of streams that interact with the Edwards Aquifer that contain important fish populations	2	0	6
S Number of downstream reservoirs with important fish populations	2	6	4
S Number of coastal areas potentially affected	3	2	4
S Number of federal listed fish species potentially affected	2	0	0
S Number of federal candidate and state listed fish species potentially affected	0	0	6
C Number of federal candidate but not state listed fish species potentially affected	5	3	2
C Number of federal candidate invertebrate species potentially affected	6	1	0
Terrestrial Biology			
S Miles (acres) of riparian vegetation disturbed	11.4 (138)	10.0 (121)	21.5 (260)
S Number of federal listed or proposed animal species potentially affected	2	4	2
S Number of federal candidate and state endangered or threatened animal species potentially affected	6	5	11
C Number of federal candidate but not state listed species potentially affected	5	4	5
Federal Candidate 1	0	0	0
Federal Candidate 2	3	2	3
Federal Candidate 3	2	2	2
S Number of federal candidate and state sensitive plant species/ communities potentially affected	6	8	5
S Number of counties crossed with oak wilt disease potential	9	12	8
Cultural Resources			
S Number of known sites within the ROW[6,7]	99	6	35
S Number of known sites within the 1-mile pipeline corridor, but exterior to the ROW[6,7]	26	36	28
C Potential impacts to unrecorded cultural resource sites within the ROW[7]	Yes	Yes	Yes

REVISED TABLE 2-12 (CONTINUED)

Code[2]	Proposed Route	Northern Alternative	Southern Alternative
Paleontological Resources			
S Crosses high and medium sensitivity units potentially containing significant fossils	Yes	Yes	Yes
S Numbers of known paleontological localities along the route[6]	2	0	2
Air Quality			
No significant impacts have been identified for the Proposed Route and the alternatives.			
Land Use and Recreation			
C Miles (acres) of cropland crossed	78 (949)	146 (1,763)	116 (1,407)
S Number of recreational resources potentially affected from an oil spill:			
Reservoirs	2	6	4
Rivers and streams	13	16	19
Bays and beach areas	5	5	5
State parks	2	1	1
National Wildlife Refuges	5	5	4
Private Resorts	2		
Total	29	33	33
Socioeconomics			
S Increase in county tax base >10 percent (county)	No[8]	10.0 (Mills)	12.3 (Kinney)
Transportation			
No significant impacts have been identified for the proposed and alternative routes.			
Visual Resources			
S Significant visual change at pump/heater stations	No	No	No
S Number of sites with visual impacts from construction	1	0	0
Noise			
S Estimated number of residences subject to noise levels from construction >65 dBA	500	750	1,300
S High noise levels (>65 dBA) from operation near residences	Yes	Yes	Yes

[1]Impact values include the implementation of the mitigation measures presented in Chapter 4.

[2]C = Area of concern (as identified during scoping) with no significant impact.
H = Potential geologic or hydrologic hazard to the pipeline.
S = Significant impact from pipeline construction or operation; details can be found in Chapter 4.

[3]Values for Edwards Aquifer recharge zone.

[4]Majority of these areas are at river crossings.

[5]Sensitive soils do not represent significant impacts but could potentially be subject to erosion and revegetation problems.

[6]Differences in the number of known sites also reflect differences in the number and intensity of surveys that have been conducted and in the site recordation methods that were used. The Class III cultural resources inventory and the paleontology survey are expected to identify additional sites.

[7]Insufficient information exists to assess the National Register elegibility of all known sites within the pipeline corridor and ROW. The cultural resources compliance plan will minimize significant impacts to sites determined to be eligible for the National Register.

[8]There would be a 7.5 percent increase in Kimble County; this increase is below the significance criterion of 10 percent.

REVISED TABLE 3-1

CHARACTERISTICS OF SENSITIVE AQUIFERS

Aquifer Recharge Zone	Age	Counties Crossed: Northern Alternative	Counties Crossed: Proposed Route	Counties Crossed: Southern Alternative	General Lithology	Total Dissolved Solids (mg/l)	Depth to Water Table (ft)	Approximate Length of Pipeline through Outcrop (miles)
Major Aquifers:								
Edwards-Trinity Plateau	Cretaceous	Upton Reagan Irion Tom Green	Upton Crockett Sutton Kimble	Upton Crockett Val Verde Edwards Kinney	Limestone, dolomite, and sandstone	200 - 1,900	0 - 500	North: 117 Proposed: 191 South: 157
Trinity Group	Cretaceous	Brown Mills Hamilton Coryell	Blanco Gillespie Hays		Sand with interbedded clays, limestone, dolomite, gravel, and conglomerate	500 - 1,500	0 - 400	North: 40 Proposed: 40 South: 0
Edwards Balcones Fault Zone	Cretaceous		Hays		Limestone and dolomite (cavernous, vugular, fractured)	300 - 1,200	50 - 200	North: 0 Proposed: 6.4 South: 0
Carrizo-Wilcox	Tertiary	Milam	Caldwell Bastrop	Medina Atascosa Bexar	Sand, sandstone, clay, silt, lignite, gravel	200 - 1,500	30 - 75	North: 13 Proposed: 16 South: 51
Gulf Coast	Tertiary-Quaternary	Fayette Washington Austin Fort Bend Brazoria Galveston Harris	Fayette Colorado Wharton Fort Bend Brazoria Galveston Harris	Karnes DeWitt Lavaca Jackson Wharton Fort Bend Galveston Brazoria Harris	Sand, silt, clay, and gravel	100 - 1,200	5 - 200	North: 149 Proposed: 146 South: 196
Minor Aquifers:								
Queen City	Tertiary	Milam Burleson	Bastrop Fayette	Wilson Gonzales	Sand, loosely cemented sandstone with interbedded clay	250 - 1,800	10 - 110	North: 11 Proposed: 4.1 South: 13
Sparta	Tertiary	Burleson	Bastrop Fayette	Wilson Gonzales	Interbedded sands and clays	< 1,000	10 - 120	North: 1.9 Proposed: 0.8 South: 1.3

Total miles of sensitive aquifers crossed: Northern Alternative = 332; Proposed Route = 404; Southern Alternative = 418.

TABLE 3-1a

CHARACTERISTICS OF SENSITIVE AQUIFERS

Aquifer Recharge Zone	Coefficient of transmissibility (gpd/ft)	Coefficient of permeability (gpd/ft^2)	Coefficient of Storage	Yield (gpm)
Major Aquifers:				
Edwards-Trinity Plateau	1,400-6,573 (Antlers)	13-38 (Antlers)[1]	0.0423 (Antlers)	122-410 (Antlers)
Trinity Group	1,500-13,000	35-103	.000056-.000084	0.5-6.4
Edwards Balcones Fault Zone	35,800-386,000[2]	58-802[2]	0.0004-0.02	542,000 (acre-feet per year)[5]
Carrizo-Wilcox	44,000 (Approx.)	70-500	0.0005	273,000 (acre-feet)[3]
Gulf Coast	6,000-85,000 (Chicot)	60-71[4] (Chicot)	0.0004-0.1 (Chicot)	78,000 (acre-feet per year) (Chicot)
Minor Aquifers:				
Queen City	14,000 (including Bigford)	10-70[4]	0.0005	5,130 (acre-feet per year)
Sparta	5,000 (including Laredo)	25-125[4]	0.0001	97 (acre-feet per year)

TABLE 3-1a (CONTINUED)

Source: Texas Department of Water Resources Report No. 235, 233, 210, 41, 195, 289; Texas Water Commission Bulletin No. 6409, 6305.

[1]Measurements taken from studies of the Antlers formation. Measurement of permeability in the Edwards and Associated Limestone is impossible due to variation in porosity.

[2]The relatively high porosity and permeability of this aquifer have resulted from the enlargement of vugs, faults, and joints by solution. Solution channels along bedding planes and the recrystallization of limestone have also contributed to greater porosity and permeability.

[3]Estimated pumpage for irrigation, public supply and industrial purposes (1969).

[4]Calculated from referenced transmissibility and aquifer saturated thickness data.

[5]Estimated average annual discharge from the aquifer by wells and springs.

REVISED TABLE 3-2

MUNICIPAL GROUNDWATER SUPPLIES[1]

PROPOSED ROUTE

Municipality	Population[2]	Source Aquifer
Ozona	3,766	Edwards-Trinity Plateau
Sonora	3,856	Edwards-Trinity Plateau
Kyle	2,093	Edwards Balcones Fault Zone
Weimar	2,128	Gulf Coast
Eagle Lake	3,921	Gulf Coast
East Bernard	1,735	Gulf Coast
Rosenburg	17,833	Gulf Coast
Alvin	16,516	Gulf Coast
Fredericksburg	8,000	Ellenberger

[1]Cities and towns with a population of over 1,000 persons which are served by a public water supply with groundwater as the primary source, within 2 miles of the pipeline route.

[2]From 1980 census or latest estimate.

REVISED TABLE 3-3

SUMMARY OF SPRING LOCATIONS

Aquifer Discharge Zone	Spring Name (Identification Number)[1]	County	Miles From Nearest Pipeline Route
Edwards-Trinity Plateau	Grierson Springs (W1)	Reagan	3 S. of Northern Alternative
	Good Springs (W2)	Irion	4.5 N. of Northern Alternative
	Dove Creek Springs (W3)	Irion	2 N. of Northern Alternative
	Pecan Spring (Q1)	Tom Green	1 S. of Northern Alternative
	Mill Spring (W4)	Tom Green	4 S. of Northern Alternative
	Lipan Spring (W6)	Tom Green	4 S. of Northern Alternative
	Fort Terrett Springs (DD16)	Sutton	3 N. of Proposed Route
	Christmas Canyon Springs (EE7)	Kimble	5 S. of Proposed Route
	Headquarters Springs (EE11)	Kimble	2 N. of Proposed Route
	Rio Bonito Springs (EE12)	Kimble	2 S. of Proposed Route
	Baily Creek Headquarters Spring	Kimble	1.5 N. of Proposed Route
	Fred Coleman	Kimble	.2 and .4 S. of Proposed Route
	Pinto Springs (KK12)	Kinney	Along Southern Alternative
Trinity Group	Guenther Spring (EE33)	Gillespie	3.5 N. of Proposed Route
Edwards Balcones Fault Zone	Salado Springs (FF1)	Bell	26 W. of Northern Alternative
	Manchaca Springs (FF10)	Travis	4.5 N. of Proposed Route
	Barton Springs (FF8)	Travis	20 N. of Proposed Route
	San Marcos Springs (MM1)	Hays	7 S. of Proposed Route
	Comal Springs (LL2g)	Comal	31 S. of Proposed Route
	Las Moras Springs (KK13)	Kinney	1 W. of Southern Alternative
	Fort Clark Springs	Kinney	3 W. of Southern Alternative
	Leona Springs:		
	Group 1 (LL11)	Uvalde	0.5 S. of Southern Alternative
	Group 2 (LL12)	Uvalde	1.5 S. of Southern Alternative
	Group 2 (LL13)	Uvalde	2.5 S. of Southern Alternative
	Group 3 (LL14)	Uvalde	4 S. of Southern Alternative

REVISED TABLE 3-3 (CONTINUED)

Aquifer Discharge Zone	Spring Name (Identification Number)[1]	County	Miles From Nearest Pipeline Route
San Antonio Springs (LL32)		Bexar	23 N. of Southern Alternative
San Pedro Springs (LL33)		Bexar	21 N. of Southern Alternative
Ellenburger-San Saba	Rocky Creek Spring (EE40)	Blanco	3.5 N. of Proposed Route
Austin Chalk	Soldiers Camp Spring (LL10)	Uvalde	0.25 S. of Southern Alternative

[1]Source: Brune (1975), see Map 3-1 for mapped locations.

REVISED TABLE 3-5

SUMMARY OF TEXAS WATER COMMISSION WATER QUALITY RESULTS

Stream	Dissolved Oxygen (mg/l)	Temperature (°C)	pH (Standard Units)	Chloride (mg/l)	Sulfate (mg/l)	Total Dissolved Solids[1] (mg/l)	Fecal Coliform (number/100 ml)	Classification and Rank*
Devil's River (Segment 2309)	9.5	70.2	8.1	16	7	208	12	Effluent-167
South Llano River (Segment 1415)	8.8	69.7	8.3	28	16	211	2	Effluent-213
Pedernales River (Segment 1414)	9.0	71.5	8.4	85	36	381	69	Effluent-165
Colorado River (Segment 1402)	8.1	71.2	8.2	61	44	332	47	Effluent-125
Brazos River (Segment 1202)	8.8	69.2	8.3	1,073	94	683	121	Effluent-88
San Bernard River (Segment 1302)	6.9	69.3	8.2	56	24	309	166	Effluent-132
Clear Creek (Segment 1101)	7.0	69.8	8.0	2,535	291	5,854	238	Water Quality-50
Oyster Creek (Segment 1110)	6.7	68.1	7.9	67	36	311	241	Effluent-94

REVISED TABLE 3-5 (CONTINUED)

Source: The State of Texas Water Quality Inventory, 8th Edition, 1986.

Note: Table illustrates average values from multiple samples collected over four years (October 1, 1981 through September 30, 1985).

*: A ranking of 1 equals the worst water quality and 311 equals the best water quality. All segments of the state have been ranked and classified as either water quality limited or effluent limited. Segments are classified as water quality limited if one of the following is true: conventional treatment of waste discharges to the segment is not stringent enough for the segment to meet applicable water quality standards; advanced waste treatment for point sources is required to protect existing exceptional water quality; or the segment is a domestic water supply reservoir with potential adverse impacts from existing or anticipated waste discharges. All other segments are classified effluent limited, indicating that conventional treatment will protect the receiving segment.

Footnotes for Table 3-5

[1]Total Dissolved Solids (TDS) were estimated by multiplying specific conductance by 0.50.

TABLE 3-5a

HYDRAULIC STREAM CHARACTERISTICS

PROPOSED ROUTE

River Crossing	Drainage Area $(mi)^2$	Average Discharge (cfs)	Maximum Recorded Discharge (cfs)	Terrain Conditions	Geology	Approach Slopes[1]	Potential for Scour[2]	Assessment
Dry Devils River	N/I	Intermittent	N/I	Headwaters of Dry Devils River, straight to irregular channel pattern, continuous floodplain.	Alluvial flood-plain deposits, possible bedrock at crosssing	Gentle	Low	Probable minor stream crossing.
South Llano River	N/A	Perennial	N/A	Irregular meander pattern, continuous floodplain.	Alluvial flood-plain deposits, possible bedrock at crossing	Gentle	Low to medium	Field and office assessments required to determine depth of burial and sag bend locations.
Pedernales River	369	31.8	13,400	Irregular meander pattern.	Alluvial flood-plain deposits, possible bedrock at crossing	N/A	Low to medium	Field and office assessments required to determine depth of burial and sag bend locations.
Colorado River	41,640	2,870	190,000	Irregular meander pattern, straight at crossing.	Alluvial flood-plain deposits	Gentle	High	Major crossing, detailed design and scour assessment required.
San Bernard River	727	496	21,200	Irregular meander pattern.	Alluvial flood-plain deposits, terracing	Gentle to moderate	Medium	Field and office assessments required to determine depth of burial and sag bend locations.
Brazos River	45,007	7,151	123,000	Irregular meander pattern with downstream progression of the meander bends.	Alluvial flood-plain deposits	Steep right bank, gentle left bank	High	Major crossing, detailed design and scour and lateral migration assessments required.
Oyster Creek	N/I	Intermittent to Perennial	N/I	Tortuous meander pattern, continuous floodplain.	Alluvial floodplain deposits	Gentle	Low	Probable minor stream crossing.
Clear Creek	38.8	36	2,170	Near mouth of Clear Creek, irregular pattern.	Alluvial flood-plain deposits	Gentle	Low	Probable minor stream crossing.

TABLE 3-5a (CONTINUED)

Note: The preliminary scour estimates were for assessment purposes. The estimate for each crossing was based on general river trends discussed in literature, research, and past experience. A detailed assessment of the scour depth is required for establishing design of pipeline burial depths at river crossings.

N/I = No published USGS information.

N/A = Not available.

[1]Flat: 0°
Gentle: 1° to 10°
Moderate: 11° to 25°
Steep: Greater than 25°

[2]Scour is defined as the depth of erosion below the average bed elevation. The potential for scour is defined as:

Low: Less than 5 feet
Medium: 5 to 10 feet
High: Greater than 10 feet

TABLE 3-5b

SUMMARY OF USGS WATER QUALITY DATA

River	Date	River Discharge (cfs)	pH	Dissolved Oxygen (mg/L)	Biochemical Oxygen Demand (mg/L)
Brazos River	11-7-83	2,550	7.8	7.4	2.8
at Richmond	3-13-84	1,770	7.8	8.6	1.4
	4-26-84	975	8.0	7.8	1.4
	11-14-84	4,600	7.8	9.6	2.0
	4-2-85	11,000	8.1	9.6	1.8
Colorado River	11-8-83	1,270	7.5	9.2	1.7
at Wharton	3-13-84	335	8.3	11.6	1.2
	6-14-84	1,530	8.5	7.9	0.9
	11-15-84	634	8.2	9.5	1.4
	4-3-85	2,330	8.1	8.6	1.5
	6-26-85	4,800	8.0	8.2	1.3
Cibolo Creek	1-27-84	26	7.1	11.0	1.7
near Falls City	4-26-85	427	7.2	8.8	2.5
	6-14-85	69	7.8	7.0	5.8
East Yegua Creek	2-13-84	23	7.2	9.2	1.8
near Dime Box	12-17-84	354	6.8	5.1	1.4
	3-22-85	1,010	7.2	7.0	3.0

REVISED TABLE 3-6

SUMMARY OF USGS FLOW RECORDS FOR THE PROPOSED ROUTE

Station Name	Drainage Area (square miles)	Average Annual Flow (cfs)	Maximum Recorded Flow (cfs)	Minimum Recorded Flow (cfs)	Period of Record
Pedernales River near Fredericksburg	369	31.8	64,000	0	1979 to current
Colorado River at Columbus	41,640	2,870	190,000	93	1903 to current
San Bernard River near Boling	727	496	21,200	2.4	1954 to current
Brazos River at Richmond	45,007	7,151	123,000	35	1903 to current
Clear Creek near Pearland	38.8	36.4	2,170	0	Sporadic 1944 to 1963; 1963 to current
Chocolate Bayou near Alvin	87.7	110	21,500	0	Sporadic 1944 to 1959; 1959 to current
South Llano River near Telegraph[1]	--	--	--	13.2[2]	NA
Devil's River[3]	NA	NA	NA	NA	NA
Oyster Creek[3]	NA	NA	NA	NA	NA

Source: USGS Water Resource Data for Texas 1984.

-- = Data not available.

[1]Low-flow partial recorder.

[2]For 1984.

[3]There are no USGS recording stations near the pipeline crossing, and no flow records are available.

REVISED TABLE 3-7

SENSITIVE GEOLOGIC FEATURES

Northern Alternative	Map Location #	Proposed Route	Map Location #	Southern Alternative	Map Location #
Surface Faulting/Subsidence		Surface Faulting/Subsidence		Surface Faulting/Subsidence	
Harris-Galveston Coastal Subsidence District	1	Harris-Galveston Coastal Subsidence District	1	Harris-Galveston Coastal Subsidence District	1
Mining Operations		Unique Geology		Potenitally Unstable Slopes	
Proposed Milam Lignite Mine	2	Caverns of Sonora	8	River Crossings:	
				Devil's River	10
Potentially Unstable Slopes		Karst Area		Dry Devil's River	11
				Frio River	12
Steep Slopes on Shale near Spring Valley	4	Karst Area in Kerr County	9	Sabinal River	13
				Guadalupe River	14
		Potentially Unstable Slopes		Colorado River	15
Steep Slopes on Shale near Cameron	5	Brazos River Crossing	19	W. Bernard Creek	16
				San Bernard River	17
River Crossings:				Brazos River	19
Leon River	6			Karst Area	
Middle Yegua Creek	7				
Brazos River	19			Karst Area in Val Verde County	18
				Karst Area in Uvalde County	20
				Topography	
				Deeply Dissected Region of the Edwards Plateau	21

REVISED TABLE 3-9

THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES OCCURRING IN WATER BODIES POTENTIALLY AFFECTED BY THE PROPOSED ROUTE

Common Name	Scientific Name	Status	Water Bodies
Fish			
San Marcos gambusia	*Gambusia georgi*	Federal and state endangered	Spring Lake in the San Marcos River
Fountain darter	*Etheostoma fonticola*	Federal and state endangered	San Marcos and Comal Rivers
Smalleye shiner	*Notropis buccula*	Federal candidate	Brazos River
Sharpnose shiner	*Notropis oxyrhynchus*	Federal candidate	Brazos and Colorado River
Widemouth blindcat	*Satan eurystomas*	Federal candidate and state threatened	Edwards Aquifer near San Antonio
Toothless blindcat	*Trogloglanis pattersoni*	Federal candidate and state threatened	Edwards Aquifer near San Antonio
Guadalupe bass	*Micropterus treculi*	Federal candidate	South Llano River, Lake Travis, Colorado River
Invertebrates			
Balcones cave amphipod	*Stygobromus balconis*	Federal candidate	Groundwater dweller; Edwards Aquifer near Austin (Hays County)
Ezell's cave amphipod	*Stygobromus flagellatus*	Federal candidate	Groundwater dweller; widespread in Edwards Aquifer (Hays County)
Texas cave shrimp	*Palaemonetes antrotum*	Federal candidate	Groundwater dweller; Edwards Aquifer (Hays and Bexar Counties)
Texas cave dytiscid beetle	*Haideoporus texanus*	Federal candidate	Groundwater dweller; Edwards Aquifer near San Marcos (Hays County)
San Marcos protoptilian caddisfly	*Protoptilian arca*	Federal candidate	Surface water species; San Marcos River below Spring Lake (Hays County)
Florida oxyethiran micro caddisfly	*Oxyethira florida*	Federal candidate	Surface water species; San Marcos River below Spring Lake (Hays County)

REVISED TABLE 3-14

THREATENED, ENDANGERED, OR SPECIAL STATUS WILDLIFE SPECIES EXPECTED TO OCCUR NEAR THE PROPOSED ROUTE, INCLUDING IMPACTS

Species	Status	Sensitive Areas	Type of Impact	Severity of Impact
Southern bald eagle	FE,SE	Bastrop, Colorado, Fort Bend, and Brazoria Counties. Nests and wintering areas near water.	Nest disturbance, oil spill at a river crossing.	2
Attwater's greater prairie chicken	FE,SE	Colorado, Fort Bend, and Galveston Counties. Breeding areas.	Year-round habitat disturbance.	1
San Marcos salamander	FT,ST	Big Spring Pool at San Marcos, Hays County.	Oil from spill entering groundwater.	4
Texas blind salamander	FE,SE	San Marcos, Hays County.	Oil from spill entering groundwater.	4
Green sea turtle	FT,ST	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Kemp's (Atlantic) Ridley sea turtle	FE,SE	Offshore marine waters, young turtles in Galveston Bay.	Oil from spill reaching Galveston Bay.	4
Loggerhead sea turtle	FT,SE	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Whales, dolphins	FT,FE,ST,SE	Offshore marine waters, only the Atlantic bottlenose dolphin is expected in Galveston Bay (not endangered or threatened).	Oil from spill reaching Galveston Bay.	5, 4
Arctic peregrine falcon	FT,ST	Coastal areas during migration, Galveston Bay.	Oil from spill affecting prey in Galveston Bay during migration.	4
American peregrine falcon	FE,SE	Coastal areas during migration, Galveston Bay.	Oil from spill affecting prey in Galveston Bay during migration.	4
Whooping crane	FE,SE	Aransas NWR - Aransas County.	Oil spill or construction impacts during migration.	5
Jaguarundi	FE,SE	Probably San Bernard NWR - Brazoria County.	Oil spill or construction impacts.	5
Brown pelican	FE,SE	Galveston Bay, Brazoria County (nest).	Oil spill reaching Galveston Bay.	4
Eskimo curlew	FE,SE	Coastal areas during migration, Galveston Bay.	Oil spill reaching Galveston Bay.	5
Piping plover	FT,ST	Coastal areas during migration and winter, Galveston Bay.	Oil spill reaching Galveston Bay.	4
Interior least tern	FE,SE	Coastal areas during migration and winter, Galveston Bay.	Oil spill reaching Galveston Bay.	4
American alligator	T S/A	No areas sensitive to disturbance.	Oil from spill or construction impacts.	2[1]
Houston toad	FE,SE	Bastrop County north of Smithville; Attwater Prairie Chicken NWR.	Oil from spill or construction impacts.	5
Leatherback sea turtle	FE,SE	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Barton Springs salamander	FC2	Barton Springs near Austin, Travis County.	Oil from spill entering groundwater.	4
Fern Bank salamander	FC2	Blanco, Hays, Gillespie, and Kerr Counties (springs, streams, caves).	Oil from spill entering groundwater.	4
Blanco blind salamander	FC2,SE	Hays County.	Oil from spill entering groundwater.	4
Alligator snapping turtle	FC2,ST	Rivers and reservoirs.	Oil from spill or construction impacts.	3
Cagle's map turtle	FC2	San Antonio and Guadalupe River systems, Kerr County (Guadalupe River).	Oil from spill or construction impacts.	3
Texas map turtle	FC2	Colorado River drainage on Edwards Plateau.	Oil from spill or construction impacts.	3
Desert kingsnake	FC3C	No sensitive areas - reported from 8 counties.	Oil from spill or construction impacts.	3
Gray-banded kingsnake	FC3C	Acacia-lechugilla-sotol succulent communities, western counties.	Oil from spill or construction impacts.	3

REVISED TABLE 3-14 (CONTINUED)

Species	Status	Sensitive Areas	Type of Impact	Severity of Impact
Reddish egret	FC2,ST	Up to 7 breeding areas in Galveston Bay.	Oil from spill reaching Galveston Bay.	4
American swallow-tailed kite	FC2,ST	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Swainson's hawk	FC2	Nests in western counties (nest locations unknown).	Primarily nest disturbance during construction.	3[2]
Ferruginous hawk	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Western snowy plover	FC2	Coastal areas during migration and winter, Galveston Bay.	Oil from spill reaching Galveston Bay.	4
Mountain plover	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Long-billed curlew	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Migrant loggerhead shrike	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Black-capped vireo	PrFE,ST	Specific shrub habitats in Crockett, Blanco, Kimble, Kerr, and Gillespie Counties.	Oil from spill or construction impacts, primarily nest disturbance.	3
Golden-cheeked warbler	FC2,ST	Ashe juniper habitats in Kimble, Kerr, Gillespie, Blanco, and Hays Counties.	Oil from spill or construction impacts.	3
Bachman's sparrow	FC2,ST	No sensitive areas.	Oil from spill or construction impacts.	4
Texas Henslow's sparrow	FC3A	Weedy field southwest of Houston; species may be extinct.	Oil from spill or construction impacts.	5
Southeastern bat	FC2	No sensitive areas.	Oil from spill or construction impacts.	5
Swift fox	FC2	No sensitive areas.	Oil from spill or construction impacts.	5
Black bear	FC2	No sensitive areas.	Oil from spill or construction impacts.	5
Texas horned lizard	ST	No sensitive areas; widespread.	Oil from spill or construction impacts.	3
White-faced ibis	ST	Up to 6 breeding areas in Galveston Bay.	Oil from spill reaching Galveston Bay.	4
White-tailed hawk	ST	Nests in eastern counties (nest locations unknown).	Primarily nest disturbance during construction.	3[2]
Zone-tailed hawk	ST	Nests in wooded canyons - Trans Pecos to Edwards Plateau (nest locations unknown).	Primarily nest disturbance during construction.	3[2]
Wood stork	ST	Galveston Bay and inland in freshwater marshes.	Oil from spill reaching Galveston Bay.	4
TOTAL = 47 Species				

Severity of Impact. Pipeline construction or operation (primarily a major oil spill) could:

1. Adversely affect a portion of the population and habitat of a federal threatened or endangered species or a state endangered species.
2. Adversely affect several individuals and habitat of a federal threatened or endangered species or a state endangered species.
3. Adversely affect several individuals or reduce the habitat of a federal candidate or state threatened species or a state endangered species.
4. Have only a remote chance of adversely affecting even a small number or reduce the habitat of a federal threatened, endangered, or candidate species, or state threatened or endangered species.
5. Have no chance of adversely affecting one of these special status species because the species migrates through the area, occurs in offshore waters, or has a very remote chance of occurring near a pipeline route.

[1]Even though this species is likely to be impacted, its current status will not require any special mitigation.

[2]Although nest locations are unknown, it is possible that nests of these species may occur along the pipeline, which would require pipeline realignment or construction timing constraints (i.e., no construction in the nesting season if the nest is active).

TABLE 3-14a

TEXAS THREATENED OR ENDANGERED SPECIES UPDATE AS OF MARCH 1, 1987
OCCURRING NEAR THE PROPOSED ROUTE

Species	Status	Sensitive Areas[1]	Type of Impact	Severity of Impact
Western smooth green snake	SE		Oil from spill or construction impacts.	2
Northern scarlet snake	ST		Oil from spill or construction impacts.	4
Timber rattlesnake	ST		Oil from spill or construction impacts.	3
Sooty tern	ST		Oil from spills.	4
Rose-throated becard	ST		No sensitive areas; migrant.	5

Severity of Impact. Pipeline construction or operation (primarily a major oil spill) could:

1. Adversely affect a portion of the population and habitat of a federal threatened or endangered species or a state endangered species.
2. Adversely affect several individuals and habitat of a federal threatened or endangered species or a state endangered species.
3. Adversely affect several individuals or reduce the habitat of a federal candidate or state threatened species or a state endangered species.
4. Have only a remote chance of adversely affecting even a small number or reduce the habitat of a federal threatened, endangered, or candidate species, or state threatened or endangered species.
5. Have no chance of adversely affecting one of these special status species because the species migrates through the area, occurs in offshore waters, or has a very remote chance of occurring near a pipeline route.

[1]Specific site information on species' occurrence is currently being processed by TNHP. Applicable data and potential impact information will be submitted to the BLM Authorized Officer.

TABLE 3-14b

LOCATIONS OF POTENTIAL BLACK-CAPPED VIREO HABITAT - PROPOSED ROUTE

Quad Name and Figure Number[1]	Location Number	County	Location[2]	Approximate Size (acres)[3]	Major Vegetation Species	Habitat Quality
Driftwood, Figure 1	P1[4]	Hays	30° 05' 20" Lat. 98° 03' 30" Long.	20.0	Sumac, live oak	Moderate to Good.
Monument Hill, Figure 2	P2	Blanco	30° 11' 00" Lat. 98° 29' 30" Long.	47.3	Sumac	Moderate to Good - small clumps, cover to ground.
Stonewall, Figure 3	P3	Gillespie	30° 12" 00" Lat. 98° 43' 00" Long.	22.6	Sumac, oaks	Moderate to Good - small clumps.
Harper West, Figure 4	P4	Gillespie	30° 15' 30" Lat. 99° 15' 45" Long.	67.3	Shin oak, sumac	Moderate to Good - cover to ground.
Harper West, Figure 4	P5	Gillespie	30° 15' 45" Lat. 99° 18' 00" Long.	101.6	Sumac, oak scrub	Moderate to Good - large clumps, cover to ground.
Harper West, Figure 5	P6	Kerr	30° 15' 45" Lat. 99° 18' 30" Long.	84.0	Sumac, oak scrub	Moderate to Good - large clumps, cover to ground.
Harper West, Figure 5	P7	Kerr	30° 16' 00" Lat. 99° 20' 15" Long.	143.5	Sumac, oak scrub	Moderate to Good - large clumps, cover to ground.
Old Noxville, Figure 6	P8	Kerr	30° 16' 15" Lat. 99° 23' 00" Long.	270.4	Sumac, oak scrub	Moderate to Good - large clumps, cover to ground.
Old Noxville, Figure 7	P9	Kerr	30° 17' 00" Lat. 99° 28" 00" Long.	88.9	Oak scrub	Moderate to Good - cover to ground.

[1]Figure number refers to supporting maps.

[2]Longitude and latitude are approximate.

[3]Acres are based on rough aerial survey mapping.

[4]Location #1 may not be accurate.

REVISED TABLE 3-17

HISTORIC SEVERE WEATHER EVENTS ALONG THE PROPOSED ROUTE

County	Representative Weather Station	Max 24-Hour Precipitation[1] (inches)	Max 24-Hour Snow[1] (inches)	Peak Wind[1] (mph)	Thunderstorms per Year[2]
Upton, Crockett	Midland	5.99	5.9	67	45
Sutton, Kimble, Kerr	San Angelo	11.75	5.8	69	46
Gillespie, Blanco, Hays, Caldwell, Bastrop, Fayette	Austin	19.03	9.7	57	51
Colorado, Wharton, Fort Bend, Brazoria, Galveston, Harris	Houston	16.95[3]	4.4	84	78

[1]Based on NOAA (1974). Data are based on information available and may not represent extreme values which occurred.

[2]Based on Changery (1981).

[3]This value represents the maximum 24-hour precipitation recorded at the Weather Service Meteorological Observatory in Galveston.

REVISED TABLE 3-27

LOCAL FIRE DEPARTMENTS AND AMBULANCE SERVICE WITHIN PROXIMITY OF PUMP/HEATER STATIONS

Location/Name[1]	Ambulance	Fire	No. of Personnel[2] Paid	No. of Personnel[2] Volunteer	Number of Fire Stations	Equipment	Route	Pump Station	Response Time (minutes)	Approximate Miles from Pump Station
Austin FD		*	623	0	38	Adequate	P	Sequin		25
Brackettville VFD		*	0	25	1	Adequate	S	3		4
Brackettville/Kinney County Volunteer	*			N/A			S	3	8	4
Brownwood FD		*	31	0	2	Adequate	N	3		44
Cameron VFD		*	1	24	1	Adequate	N	5		4
Cameron/Milam County Volunteer	*			N/A			N	5	4	4
Columbus VFD		*	0	40	1	Adequate	P/N	Sheridan/6		10/34
Columbus/Colorado County	*		N/A				P/N	Sheridan/6	15	10/34
El Campo FD	*	*	3	35	1	Adequate	S	6		8
Evant VFD		*	0	15	1	Adequate	N	4		2
Fredericksburg FD		*	3	35	1	Adequate	P	Mountain Home		40
Gillett VFD		*	0	10	1	Not Adequate	S	5		5
Hamilton Hospital	*		N/A				N	4	12	14
Houston FD	*	*	3,241	0	112	Adequate	P	Webster/Sheridan		16/72
							N	Webster		16
							S	Webster/6		16/72
Karnes City VFD		*	0	25	1	Adequate	S	4/5		80/14
Kennedy Volunteer	*			N/A			S	5	20	5
Kerrville FD		*	33	0	3	Adequate	P	Mountain Home		17
Kerrville/Kerr County EMS (Synro Inc.)	*		N/A				P	Mountain Home	13	17
Lockhart FD	*	*	9	20	1	Adequate	P	Seguin	5	6
McCamey VFD		*	0	22	1	Adequate	P/N/S	McCamey		2
Mertzon VFD	*	*	0	15	1	Adequate	N	2	<20	11
Odessa FD		*	172	0	8	Adequate	P/N/S	McCamey		70
Ozona VFD		*	0	30	1	Adequate	P/S	Sonora/2		10/12
Ozona Hospital Volunteer	*			N/A			P/S	Sonora/2	<20	10/12
Rosenberg FD	*	*	19	20	2	Adequate	P/N/S	Sheridan/6/6		40/48/40
San Angelo FD	*	*	128	0	8	Adequate	N	2/3		38/54
San Antonio FD	*	*	1,179	0	54	Adequate	S	4/5		45/60
Sealy VFD		*	0	40	1	Adequate	N	6		12
Sealy/Austin County Volunteer	*			N/A			N	6		12
Seguin FD	*	*	22	30	3	Adequate	P	Seguin		30
Sonora VFD		*	0	28	1	Not Adequate	P	Sonora		4
Sonora/Sutton County	*		N/A				P	Sonora	5	4
Temple FD	*	*	69	0	4	Adequate	N	5		25
Victoria FD		*	72	0	3	Adequate	S	5/6		40/65
Waco FD		*	169	0	10	Adequate	N	4/5		62/55

* = Designates Ambulance Service or Fire Department.

[1]FD = Fire Department; VFD = Volunteer Fire Department.

[2]N/A = Number unknown.

[3]Adequate = Fire protection can be adequately provided for the existing population and the pump station.
Not Adequate = Fire protection cannot be adequately provided because of inadequate equipment or personnel.

[4]P = Proposed Route; N = Northern Alternative; S = Southern Alternative.

TABLE 3-28a

CRUDE OIL AND LEASE CONDENSATE PRODUCTION

	MBPD			
	12-27-85[1]	3-28-86[2]	12-26-86[1]	3-27-87[2]
Alaska	1,842	1,860	1,960	1,875
California	1,186	1,163	1,085	1,078
Padd 5 Subtotal	3,061	3,023	3,045	2,953
Texas	2,436	2,419	2,180	2,142
Other U.S.	3,506	3,524	3,261	3,225
TOTAL U.S.	9,003	8,966	8,486	8,320

[1]Oil and Gas Journal 1987a.

[2]Oil and Gas Journal 1987b.

REVISED TABLE 3-31

REFINING CAPACITY

(THOUSANDS OF BPD)

	Capacity			Refined			Operated		
	12-13-85	12-19-86	4-13-87	12-13-85	12-19-86	4-13-87	12-13-85	12-19-86	4-3-87
U.S.	15,638	15,258	15,594	13,692	14,020	13,586	81.2	84.3	80.4
Texas	4,133	4,133							
California	2,339	2,339							
PADD 3	7,194	7,221	7,221	6,675	6,650	6,338	83.9	85.1	79.7
PADD 5	3,015	3,068	3,068	2,316	2,345	2,487	75.5	76.0	78.4
Texas Gulf Coast	3,706	3,738	3,738	3,375	3,417	3,232	80.9	82.1	76.4

TABLE 3-31a

IMPORTS OF CRUDE AND PRODUCTS

	MBPD			
	12-13-85[1]	4-4-86[2]	12-19-86[1]	4-3-87[2]
PADD 1 through 4				
Products	1,822	--	2,171	1,643
Crude	3,297	--	4,097	3,210
PADD 5				
Products	96	--	104	101
Crude	175	--	56	193
Total Imports U.S.	5,390	5,141	6,428	5,147

[1]Oil and Gas Journal 1987a.

[2]Oil and Gas Journal 1987b.

REVISED TABLE 3-34

EXISTING CRUDE OIL PIPELINES IN THE VICINITY OF MIDLAND, TEXAS

System Name	Destination or Pipeline Junction	Diameter (inches)	Approximate Capacity[1] (1,000 BPD) 10 pounds per square inch	Approximate Capacity[1] (1,000 BPD) 15 pounds per square inch	Approximate Mileage[2]
Amdel	Port Arthur, TX	10	26.4	33.0	540
American Petrofina	Corpus Christi, TX	10	26.4	33.0	410
Amoco	Cushing, OK	16/16	160.0	200.8	540
Basin	Cushing, OK	22	197.0	258.0	550
Exxon	Corpus Christi, TX	12	42.7	53.7	370
Exxon	Houston, TX	18	125.0	140.0	540
Mesa/W. Texas Gulf	Port Arthur, TX	24/26	312.0	395.0	580
Mobil	Corsicana, TX	12/16	166.4	207.8	400
Phillips	Borger, TX	12	42.7	53.7	340
Rancho	Houston, TX	24	250.0	316.0	450
Shell	Cushing, OK	10	26.4	33.0	480
Texas-New Mexico	Houston, TX	12	42.7	53.7	440
TOTAL			1,417.7	1,777.7	

Source: BLM and Los Angeles Harbor Department 1985, and Penwell Publishing Co. (1984).

[1]Based on no elevation change, whereas all destinations are downhill, except for El Paso and Borger.

[2]From McCamey to destination or pipeline junctions.

REVISED TABLE 3-41

SUMMARY OF USGS FLOW RECORDS FOR THE NORTHERN ALTERNATIVE

Station Name	Drainage Area (square miles)	Average Annual Flow (cfs)	Maximum Recorded Flow (cfs)	Minimum Recorded Flow (cfs)	Period of Record
South Concho River at Christoval	413	32	115,000	0	1930 to current
Colorado River near Stacy	24,193	206	356,000	0	1968 to current
Pecan Bayou near Mullin	2,073	107	13,700	0	1967 to current
Lampasas River near Kempner	818	117	71,000	1.4	1962 to current
Leon River at Gatesville	2,342	225	51,200	0	1950 to current
Little River near Rockdale	6,959	--	--	13	1981 to current
East Yegua Creek near Dime Box	244	55.6	14,000	0	1962 to current
Middle Yegua Creek near Dime Box	236	50.1	11,400	0	1962 to current
Brazos River at Richmond	45,007	7,151	123,000	35	1903 to current
Clear Creek near Pearland	38.8	36.4	2,170	0	Sporadic 1944 to 1963; 1963 to current

REVISED TABLE 3-41 (CONTINUED)

Station Name	Drainage Area (square miles)	Average Annual Flow (cfs)	Maximum Recorded Flow (cfs)	Minimum Recorded Flow (cfs)	Period of Record
Dove Creek[1]	--	--	--	--	NA
South Bosque River[1]	--	--	--	--	NA
Oyster Creek[1]	--	--	--	--	NA

Source: USGS Water Resource Data for Texas, 1984.

-- = Data not available

[1]There are no USGS recording stations near the pipeline crossing, and no flow records are available.

REVISED TABLE 3-42

SUMMARY OF TEXAS WATER COMMISSION WATER QUALITY DATA FOR THE NORTHERN ALTERNATIVE

	Dissolved Oxygen (mg/l)	Temperature (°C)	pH (standard unit)	Chloride (mg/l)	Sulfate (mg/l)	Total Dissolved Solids (mg/l)	Fecal Coliform (Number/100 ml)	Classification and Rank
South Concho River Segment 1424	7.9	65.6	7.8	45	13	319[1]	30	Effluent - 204
Colorado River Segment 1410	8.8	67.0	8.0	294	234	800[1]	48	Effluent - 203
Pecan Bayou Segment 1417	7.3	74.2	8.4	66	30	264[1]	2	Effluent - 217
Lampasas River Segment 1217	9.1	64.9	7.8	234	26	504[1]	48	Effluent - 162
Leon River Segment 1221	6.4	60.5	7.3	83	59	374[1]	52	Effluent - 109
Little River Segment 1213	9.4	65.1	7.7	41	69	258[1]	104	Effluent - 149
South Bosque River Segment 1246	9.4	63.3	7.7	15	53	140[1]	4,773	Water Quality - 65
Brazos River Segment 1202	8.8	69.2	8.3	1,073	94	683	121	Effluent - 88
Oyster Creek Segment 1110	6.7	68.1	7.9	67	36	311	241	Effluent - 94
Clear Creek Segment 1101	7.0	69.8	8.0	2,535	291	5,854	238	Water Quality - 50
Dove Creek[2]	--	--	--	--	--	--	--	--
East Yegua Creek[2]	--	--	--	--	--	--	--	--
Middle Yegua Creek[2]	--	--	--	--	--	--	--	--

Source: The State of Texas Water Quality Inventory, 8th edition, 1986.

-- = Data not available.

Note: Table illustrates average values from multiple samples collected over four years (October 1, 1981 through September 30, 1985).

[1]Total dissolved solids were estimated by multiplying specific conductance by 0.50.

[2]This segment of the stream is not within any stream classification segment.

TABLE 3-42a

HYDRAULIC STREAM CHARACTERISTICS

NORTHERN ALTERNATIVE

River Crossing	Drainage Area (mi)^2	Average Discharge (cfs)	Maximum Recorded Discharge (cfs)	Terrain Conditions	Geology	Approach Slopes[1]	Potential for Scour[2]	Assessment
Dove Creek	N/I	Intermittent	N/I	Draw, flow usually absent.	Streambed composed of cobbles to boulders, possible bedrock at crossings.	Gentle	Low	Minor stream crossing.
South Concho River	413	32	100,000	Irregular meander pattern.	Probable bedrock at crossing	Gentle	Low	Minor stream crossing with respect to scour potential. Critical crossing with respect to downstream inpact potential.
Colorado River	24,193	206	45,000	Meandering river pattern fragmentary floodplain, terraces; potential for cutoff development.	Bedrock controlled	Gentle	Probably low	Detailed field investigation required to confirm bedrock depth.
Pecan Bayou	2,073	107	13,700	Irregular meander pattern, continuous floodplain.	Alluvial flood-plain deposits	Gentle	Moderate	Field and office assessments required to determine depth of burial and sag bend locations.
Lampasas River	818	117 Intermittent at crossing	71,000	Irregular pattern, indefinite flood-plain.	Alluvium over-lying bedrock	Gentle	Low	Probable minor stream crossing.
Leon River	2,342	225	51,200	Irregular meander pattern, continuous floodplain, potential for cutoff development.	Alluvial floodplain deposits	Moderate	High	Detailed design and scour and lateral migration assessments required.
Little River	6,959	N/I	N/I	Irregular meander pattern at crossing, downstream of the Little River and San Gabrial River confluence.	Alluvial flood-plain deposits	Moderate	Moderate to high	Detailed design and scour and lateral migration assessments required.
South Bosque River	N/I	Intermittent	N/I	Pipeline crosses headwaters of South Bosque River, continuous floodplain.	Alluvial flood-plain deposits	Gentle	Low	Probable minor stream crossing.

TABLE 3-42a (CONTINUED)

River Crossing	Drainage Area (mi)^2	Average Discharge (cfs)	Maximum Recorded Discharge (cfs)	Terrain Conditions	Geology	Approach Slopes[1]	Potential for Scour[2]	Assessment
East Yegua Creek	244	56	14,000	Irregular meander pattern, potential for channel degradation.	Alluvial flood-plain deposits	Gentle	Low	Probable minor stream crossing.
Middle Yegua Creek	236	50	11,400	Irregular meander pattern.	Alluvial flood-plain deposits	Gentle	Low	Probable minor stream crossing.
Brazos River	45,007	7,151	123,000	Irregular meander pattern with downstream progression of meander bends.	Alluvial flood-plain deposits	Steep right bank, gentle left bank	High	Major crossing, detailed design and scour and lateral migration assessments required.
Oyster Creek	N/I	Intermittent to perennial	N/I	Tortuous meander pattern, continuous floodplain.	Alluvial floodplain deposits	Gentle	Low	Probable minor stream crossing.
Clear Creek	38.8	36	2,170	Irregular pattern near mouth of Clear Creek.	Alluvial flood-plain deposits	Gentle	Low	Probable minor stream crossing.

Note: The preliminary scour estimates were for assessment purposes. The estimate for each crossing was based on general river trends discussed in literature, research, and past experience. A detailed assessment of the scour depth is required for establishing design of pipeline burial depths at river crossings.

N/I = No published USGS information.

N/A = Not available.

[1]Flat: 0°
Gentle: 1° to 10°
Moderate: 11° to 25°
Steep: Greater than 25°

[2]Scour is defined as the depth of erosion below the average bed elevation. The potential for scour is defined as:

Low: Less than 5 feet
Medium: 5 to 10 feet
High: Greater than 10 feet

REVISED TABLE 3-46

SENSITIVE PLANT SPECIES/COMMUNITIES PRESENT WITHIN A 6-MILE CORRIDOR ALONG THE NORTHERN ALTERNATIVE

Species/Community	Status (Federal/TNHP)	Habitat	Location	Distance From Route
Argythamnia aphoroides (Hill country wild mercury)	C2/G2S2	Dry sandy and rocky soil over limestone hills	Just west of Christoval (Cold Creek Spring Quad) - Tom Green County	~1.6 miles (2.5 km) south
Eriogonum Nealleyi (Irion County wild buckwheat)	3C/G2S2	Rocky or gravelly soils in open grass-lands	~12.4 miles (20.7 km) west of Mertzon on Hwy 67 (Noelke Quad) - Irion County	2.2 miles (3.6 km) north
			~8.5 miles (14.2 km) west of Mertzon on Hwy 67 (Noelke Quad)- Irion County	2.4 miles (3.8 km) north
			On Hwy 915, ~3.2 miles (5.3 km) south of Hwy 67 junction (Noelke NE Quad) - Irion County	2.7 miles (4.3 km) north
Little Bluestem-Indiangrass Prairie	--/G1S1	Grassland surrounded by cedar-elm-hack-berry woodland	1.0 miles east of I-35, 1.0 miles south of Bell County line (Troy Quad) - Bell County	Route crosses range
		Small meadow	Falls/Bell County border, east of 9710, 2 miles north 3105 (Seaton Quad) Falls and Bell Counties	~1.6 miles (2.5 km) east

REVISED TABLE 3-46 (CONTINUED)

Species/Community	Status (Federal/TNHP)	Habitat	Location	Distance From Route
Little Bluestem-Indiangrass Prairie (Continued)		Meadow	0.5 mile north of Airville near Content (Seaton Quad) - Bell County	Route borders range
		Hay meadow	Intersection of FM 53 and 485 near Zabcikville, north of 485 and east of 53 (Seaton Quad) - Bell County	0.10 km (325 ft) east
		Bluestem prairie	0.75 mile west-northwest of Latium (Greenvine Quad) - Washington County	~1.6 miles (~2.6 km) east
		Hay meadow	0.9 mile southwest of FM 389 and FM2502 junction (Greenvine Quad) - Washington County	~3.1 miles (5 km) northeast
		Good bluestem prairie	1.3 mile southeast of Bleiblerville on FM 2502 (New Ulm Quad) - Austin County	~2.6 miles (4.2 km) north-east
		Oil field grassland/ hay meadow	South of 2955, east of 9625 (New Ulm Quad) - Austin County	~1.2 miles (2 km) south-west

REVISED TABLE 3-46 (CONTINUED)

Species/Community	Status (Federal/TNHP)	Habitat	Location	Distance From Route
Little Bluestem - Brownseed Paspalum Prairie	--/G1S1	Prairie converted to cropland (peanuts)	2 miles west of Sealy, south of I-10 (Sealy Quad) - Austin County	Route crosses prairie
		Prairie	4 miles west of Sealy, south of I-10 (Sealy Quad) - Austin County	~1.9 miles (2 km) south-west
Texas City Junction				
Amsonia glaberrima (Smooth blue star)	C2/G2QS2	Coastal prairie	Near Texas City (Texas City and Virginia Point Quad) - Galveston County	3.1 miles (5 km) north-northeast of endpoint
Chloris texensis (Texas windmill grass)	C2/G2S2	Exposed clay lowland	3 miles south of Alvin (Liverpool Quad) - Brazoria County	1.2 miles (2 km) north
Liatris bracteata (Coastal gayfeather)	--/G2S2	Coastal marsh or Savannah	Southeast edge of Hitchcock (Hitchcock Quad) - Galveston County	1.1 mile (1.8 km) north

REVISED TABLE 3-47

THREATENED, ENDANGERED, OR SPECIAL STATUS WILDLIFE SPECIES EXPECTED TO OCCUR NEAR THE NORTHERN ALTERNATIVE, INCLUDING IMPACTS

Species	Status	Sensitive Areas	Type of Impact	Severity of Impact
Southern bald eagle	FE,SE	Fort Bend and Brazoria Counties; nests and wintering areas near water.	Nest disturbance, oil spill at a river crossing.	2
Concho water snake	FT,SE	Colorado River at pipeline crossing and downstream.	Oil from spill and construction impacts.	1
Attwater's greater prairie chicken	FE,SE	Austin, Fort Bend and Galveston Counties. Breeding areas.	Year-round habitat disturbance.	1
Green sea turtle	FT,ST	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Kemp's (Atlantic) Ridley sea turtle	FE,SE	Offshore marine waters, young turtles in Galveston Bay.	Oil from spill reaching Galveston Bay.	4
Loggerhead sea turtle	FT,SE	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Whales, dolphins	FT,FE,ST,SE	Offshore marine waters, only the Atlantic bottlenose dolphin is expected in Galveston Bay (not endangered or threatened).	Oil from spill reaching Galveston Bay.	5, 4
Arctic peregrine falcon	FT,ST	Coastal areas during migration, Galveston Bay.	Oil from spill affecting prey in Galveston Bay during migration.	4
American peregrine falcon	FE,SE	Coastal areas during migration, Galveston Bay.	Oil from spill affecting prey in Galveston Bay during migration.	4
Whooping crane	FE,SE	Aransas NWR - Aransas County.	Oil spill or construction impacts during migration.	5
Jaguarundi	FE,SE	Probably San Bernard NWR - Brazoria County.	Oil spill or construction impacts.	5
Brown pelican	FE,SE	Galveston Bay, Brazoria County (nest).	Oil spill reaching Galveston Bay.	4
Eskimo curlew	FE,SE	Coastal areas during migration, Galveston Bay.	Oil spill reaching Galveston Bay.	5
Piping plover	FT,ST	Coastal areas during migration and winter, Galveston Bay.	Oil spill reaching Galveston Bay.	4
Interior least tern	FE,SE	Coastal areas during migration and winter, Galveston Bay.	Oil spill reaching Galveston Bay.	4
American alligator	T S/A	No sensitive areas.	Oil from spill or construction impacts.	2[1]
Houston toad	FE,SE	Burleson County north of Caldwell; Attwater Prairie Chicken NWR.	Oil from spill or construction impacts.	5
Leatherback sea turtle	FE,SE	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Fern Bank salamander	FC2	Bell County (springs, streams, caves).	Oil from spill entering groundwater.	4
Alligator snapping turtle	FC2,ST	Rivers and reservoirs.	Oil from spill or construction impacts.	3
Texas map turtle	FC2	Colorado River drainage on Edwards Plateau.	Oil from spill or construction impacts.	3
Desert kingsnake	FC3C	No sensitive areas - reported from 6 counties.	Oil from spill or construction impacts.	3
Gray-banded kingsnake	FC3C	Acacia-lechugilla-sotol succulent communities, western counties.	Oil from spill or construction impacts.	3
Reddish egret	FC2,ST	Up to 7 breeding areas in Galveston Bay.	Oil from spill reaching Galveston Bay.	4
American swallow-tailed kite	FC2,ST	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Swainson's hawk	FC2	Nests in western counties (nest locations unknown).	Primarily nest disturbance during construction.	3[2]
Ferruginous hawk	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Western snowy plover	FC2	Coastal areas during migration and winter, Galveston Bay.	Oil from spill reaching Galveston Bay.	4

REVISED TABLE 3-47 (CONTINUED)

Species	Status	Sensitive Areas	Type of Impact	Severity of Impact
Mountain plover	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Long-billed curlew	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Migrant loggerhead shrike	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Black-capped vireo	PrFE,ST	Specific shrub habitats in Crockett, Tom Green, Irion, and Bell Counties.	Oil from spill or construction impacts, primarily nest disturbance.	3
Golden-cheeked warbler	FC2,ST	Ashe juniper habitats in Hamilton, Coryell, and Bell Counties.	Oil from spill or construction impacts.	3
Bachman's sparrow	FC2,ST	No sensitive areas.	Oil from spill or construction impacts.	4
Texas Henslow's sparrow	FC3A	Weedy field southwest of Houston; species may be extinct.	Oil from spill or construction impacts.	5
Southeastern bat	FC2	No sensitive areas.	Oil from spill or construction impacts.	5
Swift fox	FC2	No sensitive areas.	Oil from spill or construction impacts.	5
Black bear	FC2	No sensitive areas.	Oil from spill or construction impacts.	5
Texas horned lizard	ST	No sensitive areas; widespread.	Oil from spill or construction impacts.	3
White-faced ibis	ST	Up to 6 breeding areas in Galveston Bay.	Oil from spill reaching Galveston Bay.	4
White-tailed hawk	ST	Nests in eastern counties (nest locations unknown).	Primarily nest disturbance during construction.	3[2]
Zone-tailed hawk	ST	Nests in wooded canyons - Trans Pecos to Edwards Plateau (nest locations unknown).	Primarily nest disturbance during construction.	3[2]
Wood stork	ST	Galveston Bay and inland in freshwater marshes.	Oil from spill reaching Galveston Bay.	4
TOTAL = 43 Species				

Severity of Impact. Pipeline construction or operation (primarily a major oil spill) could:

1. Adversely affect a portion of the population and habitat of a federal threatened or endangered species or state endangered species.
2. Adversely affect several individuals and habitat of a federal threatened or endangered species or state endangered species.
3. Adversely affect several individuals or reduce the habitat of a federal candidate or state threatened species.
4. Have only a remote chance of adversely affecting even a small number or reduce the habitat of a federal threatened, endangered, or candidate species, or state threatened or endangered species.
5. Have no chance of adversely affecting one of these special status species because the species migrates through the area, occurs in offshore waters, or has a very remote chance of occurring near a pipeline route.

[1]Even though this species is likely to be impacted, its current status will not require any special mitigation.

[2]Although nest locations are unknown, it is possible that nests of these species may occur along the pipeline, which would require pipeline realignment or construction timing constraints (i.e., no construction in the nesting season if the nest is active).

TABLE 3-47a

TEXAS THREATENED OR ENDANGERED SPECIES UPDATE AS OF MARCH 1, 1987
OCCURRING NEAR THE NORTHERN ALTERNATIVE

Species	Status	Sensitive Areas[1]	Type of Impact	Severity of Impact
Western smooth green snake	SE		Oil from spill or construction impacts.	2
Brazos water snake	ST		Oil from spill or construction impacts.	3
Northern scarlet snake	ST		Oil from spill or construction impacts.	4
Timber rattlesnake	ST		Oil from spill or construction impacts.	3
Sooty tern	ST		Oil from spills.	4
Rose-throated becard	ST		No sensitive areas; migrant.	5

Severity of Impact. Pipeline construction or operation (primarily a major oil spill) could:

1. Adversely affect a portion of the population and habitat of a federal threatened or endangered species or state endangered species.
2. Adversely affect several individuals and habitat of a federal threatened or endangered species or state endangered species.
3. Adversely affect several individuals or reduce the habitat of a federal candidate or state threatened species.
4. Have only a remote chance of adversely affecting even a small number or reduce the habitat of a federal threatened, endangered, or candidate species, or state threatened or endangered species.
5. Have no chance of adversely affecting one of these special status species because the species migrates through the area, occurs in offshore waters, or has a very remote chance of occurring near a pipeline route.

[1]Specific site information on species' occurrence is currently being processed by TNHP. Applicable data and potential impact information will be submitted to the BLM Authorized Officer.

TABLE 3-47b

LOCATIONS OF POTENTIAL BLACK-CAPPED VIREO HABITAT - NORTHERN ALTERNATIVE

Quad Name and Figure Number[1]	Location Number	County	Location[2]	Approximate Size (acres)[3]	Major Vegetation Species	Habitat Quality
Mullin, Figure 1	N1	Mills	31° 33' 00" Lat. 98° 33' 00" Long.	12.5	Flame leaf sumac, oak	Good.
Mullin, Figure 1	N2	Mills	31° 33' 00" Lat. 98° 31'00" Long.	27.5	Oak, flame leaf sumac, *Rhus trilobata*	Poor - heavily browsed.
Caradan, Figure 2	N3	Mills	31° 31° 30" Lat. 98° 27' 30" Long.	62.2	Oak scrub	Good - flat ground, height and spacing good.
Caradan, Figure 3	N4	Mills	31° 31' 00" Lat. 98° 25' 00" Long.	23.9	Oak scrub	Range Good to Poor - depending on browse intensity.
Caradan, Figure 3	N5	Mills	31° 31' 00" Lat. 98° 23' 00" Long.	64.2	Scrub	Good - ridge top, mixed tree heights and clump sizes.
Pecan Wells, Figure 4	N6	Mills	31° 31' 00" Lat. 98° 22' 00" Long.	49.3	Scrub oak	Good - taller trees, foliage to ground, ridge top.
Shive, Figure 5	N7	Hamilton	31° 30° 00" Lat. 98° 14' 00" Long.	121.1	Species unknown	Good - size and height, may be too closed.
Shive, Figure 6	N8	Hamilton	31° 30' 30" Lat. 98° 11' 00" Long.	34.3	Species unknown	Poor - too closed.
Shive, Figure 6	N9	Hamilton	31° 30' 30" Lat. 98° 11' 00" Long.	14.7	Oak scrub	Moderate - low, patchy.
Gatesville East, Figure 7	N10	Coryell	31° 29' 30" Lat. 97° 39' 00" Long.	23.0	Oak	Moderate to Poor - head of small canyon.

[1]Figure number refers to supporting maps.

[2]Longitude and latitude are approximate.

[3]Acres are based on rough aerial survey mapping.

TABLE 3-58a

HYDRAULIC STREAM CHARACTERISTICS

SOUTHERN ALTERNATIVE

River Crossing	Drainage Area $(mi)^2$	Average Discharge (cfs)	Maximum Recorded Discharge (cfs)	Terrain Conditions	Geology	Approach Slopes[1]	Potential for Scour[2]	Assessment
Devil's River	N/I	Intermittent	N/I	Irregular meander pattern, continuous floodplain.	Alluvial flood-plain deposits, possible bedrock at crossing	Gentle	Medium to high	Detailed field and office assessments required to determine depth of burial and sag bend locations.
Nueces River	1861	118	189,000	Irregular meander pattern, downstream migration of river bends, continuous floodplain.	Alluvial flood-plain deposits	Gentle	Medium to high	Detailed field and office assessments required to determine depth of burial and sag bend locations.
Leona River	N/I	Intermittent	N/I	Irregular meander pattern, indefinite floodplain.	Alluvial flood-plain deposits	Gentle	Medium	Detailed field and office assessments required.
Frio River	631	28	88,500	Irregular meander pattern, indefinite floodplain.	Alluvial flood-plain deposits	Moderate	Medium	Detailed field and office assessments required.
Sabinal River	241	31	73,300	Irregular meander pattern, indefinite floodplain.	Alluvial flood-plain deposits	Moderate	Medium	Detailed field and office assessments required.
Seco Creek	168	8	30,500	Irregular meander pattern, intermittent stream, continuous floodplain.	Alluvial flood-plain deposits	Gentle	Low to medium	Detailed assessment required.
Hondo Creek	149	13	46,900	Irregular meander pattern, intermittent stream, continuous floodplain.	Alluvial flood-plain deposits	Gentle	Low to medium	Detailed assessment required.
San Antonio River	1743	504	40,000	Irregular meander pattern, incised.	Alluvial flood-plain deposits	Moderate	Medium to high	Detailed assessment required.
Cibolo Creek	827	121	33,600	Irregular meander pattern, straight at crossing.	Alluvial flood-plain deposits	Gentle	Low to medium	Detailed field assessment required.
Guadalupe River	4,934	1,988	132,000	Irregular meander pattern, potential for cutoff development, continuous floodplain.	Alluvial flood-plain deposits	Gentle	Medium	Detailed assessment required.
Lavaca River	108	51	99,500	Irregular meander pattern, indefinite floodplain.	Alluvial flood-plain deposits	Gentle	Medium to high	Detailed assessment required.

TABLE 3-58a (CONTINUED)

River Crossing	Drainage Area (mi)^2	Average Discharge (cfs)	Maximum Recorded Discharge (cfs)	Terrain Conditions	Geology	Approach Slopes[1]	Potential for Scour[2]	Assessment
Navidad River	437	N/I	19,300	Irregular meander pattern, indefinite floodplain.	Alluvial flood-plain deposits	Moderate	Medium to high	Detailed assessment required.
Colorado River	42,003	2,446	100,000	Irregular meander pattern, continuous floodplain.	Alluvial flood-plain deposits	Gentle	High	Major crossing, detailed design required.
San Bernard River	727	496	21,200	Irregular meander pattern.	Alluvial flood-plain deposits	Gentle to moderate	Medium	Field and office assessments required to determine depth of burial and sag bend locations.
Brazos River	45,007	7,151	123,000	Irregular meander pattern with downstream progression of meander bends.	Alluvial flood-plain deposits	Steep right bank, gentle left bank	High	Major crossing, detailed design and scour and lateral migration assessments required.
Oyster Creek	N/I	Intermittent to perennial	N/I	Tortuous meander pattern, continuous floodplain.	Alluvial flood-plain deposits	Gentle	Low	Probable minor crossing.
Clear Creek	38.8	36	2,170	Irregular pattern near mouth of Cleer Creek.	Alluvial flood-plain deposits	Gentle	Low	Probable minor crossing.

Note: The preliminary scour estimates were for assessment purposes. The estimate for each crossing was based on general river trends discussed in literature, research, and past experience. A detailed assessment of the scour depth is required for establishing design of pipeline burial depths at river crossings.

N/I = No published USGS information.

N/A = Not available.

[1]Flat: 0°
Gentle: 1° to 10°
Moderate: 11° to 25°
Steep: Greater than 25°

[2]Scour is defined as the depth of erosion below the average bed elevation. The potential for scour is defined as:

Low: Less than 5 feet
Medium: 5 to 10 feet
High: Greater than 10 feet

REVISED TABLE 3-59

SUMMARY OF TEXAS WATER COMMISSION WATER QUALITY RESULTS

SOUTHERN ALTERNATIVE

Stream	Dissolved Oxygen (mg/l)	Temperature (°C)	pH (standard unit)	Chloride (mg/l)	Sulfate (mg/l)	Total Dissolved[1] Solids (mg/l)	Fecal Coliform (Number/100 ml)	Classification and Rank
Devil's River Segment 2309	9.5	70.2	8.1	16	7	208	12	Effluent - 167
Nueces River Segment 2112	8.7	72.1	7.8	22	13	218	2	Effluent - 239
Leona River Segment 2109	8.6	69.3	8.0	105	155	552	108	Effluent - 148
Frio River Segment 2106	8.4	72.6	7.7	296	155	800	44	Effluent - 121
Sabinal River Segment 2110	6.6	71.5	7.5	110	50	481	53	Effluent - 295
Seco Creek Segment 2115	10.6	70.7	8.3	16	44	206	3	Effluent - 243
Hondo Creek Segment 2114	9.8	69.8	8.2	16	43	207	33	Effluent - 208
San Antonio River Segment 1901	7.8	71.5	7.9	118	96	539	412	Effluent - 87
Cibolo Creek Segment 1902	9.0	68.0	8.2	124	165	705	132	Effluent - 95
Guadalupe River Segment 1803	7.8	74.6	8.0	47	30	293	66	Effluent - 171
Lavaca River Segment 1602	10.1	74.2	8.1	130	40	495	198	Effluent - 96
Navidad River Segment 1605	8.0	70.5	7.7	73	15	377	209	Effluent - 284
Colorado River Segment 1402	8.1	71.2	8.2	61	44	332	47	Effluent - 125
San Bernard River Segment 1302	6.9	69.3	8.2	56	24	309	166	Effluent - 132
Brazos River Segment 1202	8.8	69.2	8.3	1,073	94	683	121	Effluent - 88

REVISED TABLE 3-59 (CONTINUED)

Stream	Dissolved Oxygen (mg/l)	Temperature (°C)	pH (standard unit)	Chloride (mg/l)	Sulfate (mg/l)	Total Dissolved[1] Solids (mg/l)	Fecal Coliform (Number/100 ml)	Classification and Rank
Oyster Creek Segment 1110	6.7	68.1	7.9	67	36	311	241	Effluent - 94
Clear Creek Segment 1101	7.0	69.8	8.0	2,535	291	5,854	238	Water Quality - 31

Source: The State of Texas Water Quality Inventory, 8th edition, 1986.

Note: Table illustrates average values from multiple samples collected over four years (October 1, 1981 through September 30, 1985).

[1]Total dissolved solids were estimated by multiplying specific conductance by 0.50.

REVISED TABLE 3-60

SUMMARY OF USGS FLOW RECORDS FOR THE

SOUTHERN ALTERNATIVE

Station Name	Drainage Area (square miles)	Average Annual Flow (cfs)	Maximum Recorded Flow (cfs)	Minimum Recorded Flow (cfs)	Period of Record
Nueces River below Uvalde	1,861	118	616,000	0	1939 to current
Frio River below Dry Frio River near Uvalde	631	28.4	88,500	0	1952 to current
Sabinal River at Sabinal	241	31.0	73,300	0	1952 to current
Seco Creek at Rowe Ranch near O'Hanis	168	8.07	35,800	0	1960 to current
Hondo Creek at King Waterhole near Hondo	149	13.5	46,900	0	1960 to current
San Antonio River near Elmendorf	1,743	504	40,000	12	1962 to current
Cibolo Creek near Falls City	827	121	35,000	0	1930 to current
Guadalupe River at Cuero	4,934	1,988	132,000	28	1902 to current
Lavaca River at Hallettsville	108	51.2	99,500	0	1939 to current
Navidad River near Speaks	437	--	19,300	1.8	1981 to current

REVISED TABLE 3-60 (CONTINUED)

Station Name	Drainage Area (square miles)	Average Annual Flow (cfs)	Maximum Recorded Flow (cfs)	Minimum Recorded Flow (cfs)	Period of Record
Colorado River at Wharton	42,003	2,446	100,000	0[1]	Sporadic 1916 to 1938; 1938 to current
San Bernard River near Boling	727	496	21,200	2.4	1954 to current
Brazos River at Richmond	45,007	7,151	123,000	35	1903 to current
Clear Creek near Pearland	38.8	36.4	2,170	0	Sporadic 1944 to 1963; 1963 to current
Chocolate Bayou near Alvin	87.7	110	21,500	0	Sporadic 1944 to 1959; 1959 to current
Devil's River[2]	--	--	--	--	
Leona River[2]	--	--	--	--	
Oyster Creek[2]	--	--	--	--	

Source: USGS Water Resource Data for Texas, 1984.

-- = Data not available.

[1]No flow on August 6, 1925 as a result of pumping.

[2]There are no USGS recording stations near the pipeline crossing and no flow records are available.

REVISED TABLE 3-66

THREATENED, ENDANGERED, OR SPECIAL STATUS WILDLIFE SPECIES EXPECTED TO OCCUR NEAR THE SOUTHERN ALTERNATIVE, INCLUDING IMPACTS

Species	Status	Sensitive Areas	Type of Impact	Severity of Impact
Southern bald eagle	FE,SE	Fort Bend and Brazoria Counties. Nests and wintering areas near water.	Nest disturbance, oil spill at a river crossing.	2
Attwater's greater prairie chicken	FE,SE	No known occupied habitat in Fort Bend and Galveston Counties near the pipeline.	Year-round habitat disturbance.	1[1]
Green sea turtle	FT,ST	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Kemp's (Atlantic) Ridley sea turtle	FE,SE	Offshore marine waters, young turtles in Galveston Bay.	Oil from spill reaching Galveston Bay.	4
Loggerhead sea turtle	FT,SE	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Whales, dolphins	FT,FE,ST,SE	Offshore marine waters, only the Atlantic bottlenose dolphin is expected in Galveston Bay (not endangered or threatened).	Oil from spill reaching Galveston Bay.	5,4
Arctic peregrine falcon	FT,ST	Coastal areas during migration, Galveston Bay.	Oil from spill affecting prey in Galveston Bay.	4
American peregrine falcon	FE,SE	Coastal areas during migration, Galveston Bay.	Oil from spill affecting prey in Galveston Bay during migration.	4
Whooping crane	FE,SE	Aransas NWR - Aransas County.	Oil spill or construction impacts during migration.	5
Jaguarundi	FE,SE	Probably San Bernard NWR - Brazoria County.	Oil spill or construction impacts.	5
Brown pelican	FE,SE	Galveston Bay, Brazoria County (nest).	Oil spill reaching Galveston Bay.	4
Eskimo curlew	FE,SE	Coastal areas during migration, Galveston Bay.	Oil spill reaching Galveston Bay.	5
Piping plover	FT,ST	Coastal areas during migration and winter, Galveston Bay.	Oil spill reaching Galveston Bay.	4
Ocelot	FE,SE	No sensitive areas.	Oil from spill and construction impacts.	5
Interior least tern	FE,SE	Coastal areas during migration and winter, Galveston Bay.	Oil spill reaching Galveston Bay.	4
American alligator	T S/A	No sensitive areas.	Oil from spill or construction impacts.	2[2]
Houston toad	FE,SE	No sensitive areas.	Oil from spill or construction impacts.	5
Leatherback sea turtle	FE,SE	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Hawksbill sea turtle	FE,SE	Offshore marine waters.	Oil from spill reaching offshore waters.	5
Fern Bank salamander	FC2,ST	Bexar, Uvalde, Medina, Kinney, Val Verde, and Edwards (springs, streams, caves).	Oil from spill entering groundwater.	4
Cascade Caverns salamander	FC3B,ST	Kendall County (springs).	Oil from spill entering groundwater.	4
Comal blind salamander	FC2,ST	Bexar County (springs).	Oil from spill entering groundwater.	4
Valdina Farms salamander	FC3B	Medina County (springs).	Oil from spill entering groundwater.	4
Black-spotted newt.	FC2,SE	Wet areas.	Oil from spill or construction impacts.	3
Rio Grande lesser siren	FC2,SE	Water.	Oil from spill or construction impacts.	3
Alligator snapping turtle	FC2,ST	Rivers and reservoirs.	Oil from spill or construction impacts.	3
Cagle's map turtle	FC2	San Antonio and Guadalupe River systems; Karnes, Wilson, Bexar, and DeWitt Counties.	Oil from spill or construction impacts.	3
Texas map turtle	FC2	Colorado River drainage on Edwards Plateau.	Oil from spill or construction impacts.	3
Reticulate collared lizard	FC2,ST	Uvalde County (deserts).	Oil from spill or construction impacts.	3

REVISED TABLE 3-66 (CONTINUED)

Species	Status	Sensitive Areas	Type of Impact	Severity of Impact
Desert kingsnake	FC3C	No sensitive areas - reported from 6 counties.	Oil from spill or construction impacts.	3
Gray-banded kingsnake	FC3C	Acacia-lechugilla-sotol succulent communities, western counties.	Oil from spill or construction impacts.	3
Reddish egret	FC2,ST	Up to 7 breeding areas in Galveston Bay.	Oil from spill reaching Galveston Bay.	4
American swallow-tailed kite	FC2,ST	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Swainson's hawk	FC2	Nests in western counties (nest locations unknown).	Primarily nest disturbance during construction.	3[3]
Ferruginous hawk	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Western snowy plover	FC2	Coastal areas during migration and winter, Galveston Bay.	Oil from spill reaching Galveston Bay.	4
Mountain plover	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Long-billed curlew	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Migrant loggerhead shrike	FC2	No sensitive areas - migrant.	Oil from spill or construction impacts.	5
Black-capped vireo	PrFE,ST	Specific shrub habitats in Crockett, Bexar, Uvalde, and Edwards Counties.	Oil from spill or construction impacts. Primarily nest disturbance.	3
Golden-cheeked warbler	FC2,ST	Ashe juniper habitats in Edwards, Kinney, Uvalde, Medina, Atascosa, Bexar, and Wilson Counties.	Oil from spill or construction impacts.	3
Bachman's sparrow	FC2,ST	No sensitive areas.	Oil from spill or construction impacts.	4
Texas Henslow's sparrow	FC3A	Weedy field southwest of Houston; species may be extinct.	Oil from spill or construction impacts.	5
Southeastern bat	FC2	No sensitive areas.	Oil from spill or construction impacts.	5
Swift fox	FC2	No sensitive areas.	Oil from spill or construction impacts.	5
Black bear	FC2	No sensitive areas.	Oil from spill or construction impacts.	5
Texas tortoise	ST	Val Verde, Kinney, Uvalde, Medina, Atascosa, Bexar, Wilson, Karnes, and Lavaca Counties (deserts).	Oil from spill or construction impacts.	3
Texas horned lizard	ST	No sensitive areas; widespread.	Oil from spill or construction impacts.	3
Texas Indigo snake	ST	No sensitive areas.	Oil from spill or construction impacts.	3
White-faced ibis	ST	Up to 6 breeding areas in Galveston Bay.	Oil from spill reaching Galveston Bay.	4
White-tailed hawk	ST	Nests in eastern counties (nest locations unknown).	Primarily nest disturbance during construction.	3[3]
Zone-tailed hawk	ST	Nests in wooded canyons - Trans Pecos to Edwards Plateau (nest locations unknown).	Primarily nest disturbance during construction.	3[3]
Wood stork	ST	Galveston Bay and inland in freshwater marshes.	Oil from spill reaching Galveston Bay.	4
Common black hawk	ST	Nests in western counties (nest locations unknown); riparian canyons.	Primarily nest disturbance during constructon.	3[3]
Total 54 Species				

REVISED TABLE 3-66 (CONTINUED)

Severity of Impact. Pipeline construction or operation (primarily a major oil spill) could:

1. Adversely affect a portion of the population and habitat of a federal threatened or endangered species or a state endangered species.
2. Adversely affect several individuals and habitat of a federal threatened or endangered species or a state endangered species.
3. Adversely affect several individuals or reduce the habitat of a federal candidate or state threatened species.
4. Have only a remote chance of adversely affecting even a small number or reduce the habitat of a federal threatened, endangered, or candidate species, or state threatened or endangered species.
5. Have no chance of adversely affecting one of these special status species because the species migrates through the area, or occur in offshore waters, or has a very remote chance of occurring near a pipeline route.

[1]This species would receive a rating only if it were later found to occur near the pipeline during 1987 field surveys, near Iowa Colony in Galveston County.

[2]Even though this species is likely to be impacted, its current status will not require any special mitigation.

[3]Although nest locations are unknown, it is possible that nests of these species may occur along the pipeline, which would require pipeline realignment or construction timing constraints (no construction in the nesting season if the nest is active).

TABLE 3-66a

TEXAS THREATENED OR ENDANGERED SPECIES UPDATE AS OF MARCH 1, 1987
OCCURRING NEAR THE SOUTHERN ALTERNATIVE

Species	Status	Sensitive Areas[1]	Type of Impact	Severity of Impact
Western smooth green snake	SE		Oil from spill or construction impacts.	2
Northern scarlet snake	ST		Oil from spill or construction impacts.	4
Big Bend blackhead snake	ST		Oil from spill or construction impacts.	3
Timber rattlesnake	ST		Oil from spill or construction impacts.	3
Sooty tern	ST		Oil from spills.	4
Rose-throated becard	ST		No sensitive areas; migrant.	5

Severity of Impact. Pipeline construction or operation (primarily a major oil spill) could:
1. Adversely affect a portion of the population and habitat of a federal threatened or endangered species or a state endangered species.
2. Adversely affect several individuals and habitat of a federal threatened or endangered species or a state endangered species.
3. Adversely affect several individuals or reduce the habitat of a federal candidate or state threatened species.
4. Have only a remote chance of adversely affecting even a small number or reduce the habitat of a federal threatened, endangered, or candidate species, or state threatened or endangered species.
5. Have no chance of adversely affecting one of these special status species because the species migrates through the area, or occur in offshore waters, or has a very remote chance of occurring near a pipeline route.

[1]Specific site information on species' occurrence is currently being processed by TNHP. Applicable data and potential impact information will be submitted to the BLM Authorized Officer.

TABLE 3-66b

LOCATIONS OF POTENTIAL BLACK-CAPPED VIREO HABITAT - SOUTHERN ALTERNATIVE

Quad Name and Figure Number[1]	Location Number	County	Location[2]	Approximate Size (acres)[3]	Major Vegetation Species	Habitat Quality
Flat Rock Creek, NW, Figure 1	S1	Val Verde	29° 43' 30" Lat. 100° 45' 00" Long	23.9	Oak, juniper, madrone	Moderate - steep slope, heavily browsed.
Devils Lake, Figure 2	S2	Val Verde	29° 45' 00" Lat. 100° 46' 00" Long.	10.2	Species unknown	Poor - heavily browsed.
Dry Devil, Figure 3	S3	Val Verde	29° 47' 00" Lat. 100° 48' 00" Long.	6.3	Oak	Moderate - not enough clumps.
Dry Devil, Figure 3	S4	Val Verde	29° 50' 00" Lat. 100° 51' 00" Long.	7.0	Oak, mountain laurel	Moderate - dense, species good, good height, too closed, canyon bottom.
Dry Devil, Figute 4	S5	Val Verde	29° 55' 00" Lat. 100° 55' 30" Long.	9.6	Acacia	Poor - too low, canyon bottom.
Deaton Draw, Figure 5	S6	Val Verde	30° 00' 00" Lat. 101° 01' 00" Long.	10.4	Oak, mountain laurel	Moderate - steep slope, canyon head, too dense.
Deaton Draw, Figure 5	S7	Val Verde	30° 00' 30" Lat. 101° 01' 30" Long.	12.2	Oak, mountain laurel	Moderate - steep slope, canyon head, too dense.
Bee Canyon, Figure 6	S8	Val Verde	30° 10' 00" Lat. 101° 10' 00" Long.	18.5	Oak, mountain laurel, juniper	Moderate - canyon head, trees to tall.
Bee Canyon, Figure 6	S9	Val Verde	30° 11' 00" Lat. 101° 9' 30" Long.	55.2	Oak, mountain laurel	Moderate - canyon rim, too open and tall.
Bee Canyon, Figure 6	S10	Val Verde	30° 12' 00" Lat. 101° 9' 00" Long.	43.2	Juniper	Poor - too much juniper, structure and height adequate, canyon and rim.
Indian Draw, Figure 7	S11	Val Verde	30° 15' 30" Lat. 101° 14' 30" Long.	14.4	Species unknown	Moderate - canyon head, below ridge top.
Indian Draw, Figure 7	S12	Val Verde	30° 16' 30" Lat. 101° 14' 30" Long.	50.5	Species unknown	Moderate - canyon head, below limestone outcrop.
Aermotor Draw, Figure 8	S13	Val Verde	30° 17' 00" Lat. 101° 15' 30" Long.	20.8	Mountain laurel	Moderate - below limestone outcrop.
Aermotor Draw, Figure 8	S14	Val Verde	30° 17' 00" Lat. 101° 15' 30" Long.	20.4	Species unknown	Moderate to Good - canyon heads, 3 to 4 good areas at this location.

[1]Figure number refers to supporting maps.

[2]Longitude and latitude are approximate.

[3]Acres are based on rough aerial survey mapping.

REVISED TABLE 4-1

COMPARISON OF SALIENT DETAILS OF API 5L

AND ALL AMERICAN MAINLINE PIPE SPECIFICATIONS

	Category	All American Pipeline Requirement	API Requirement
1.	Cold Expansion Limitation	1.50% Maximum	None Specified
2.	Chemical Composition	0-0.15% Maximum MN-1.60% Max. Sulfur - 0.014% Max. Phosphorus - 0.023% Max.	0-0.20% Maximum MN-1.60% Max. Sulfur - 0.050% Max. Phosphorus - 0.040% Max.
3.	Carbon Equivalent	CE - 0.42 Maximum	None Specified
4.	Ladle or Heat Analysis	Requested	Not Required to be Reported
5.	Specific Chemical Addition	To be Informed	Not Required to be Reported
6.	Product Chemical Analysis	To Be Reported	Not Required to be Reported
7.	Hardness Test Criteria	Maximum of 260 HV10	Not Required
8.	Toughness Criteria	Supplemental Req. SR5 of API 5L	Must Be Specified
9.	Residual Magnetism Criteria	Less Than 10 Gauss	Not Specified
10.	Hydrostatic Test Pressure	95% of Specified Minimum Yield Strength (SMYS)	90% of SMYS
11.	Diameter of Pipe Body	+0.45% -0.25%	+0.75% -0.25%
12.	Wall Thickness	+15% -8%	+19.5% -8%
13.	Pipe End Radiographic Inspection	11W - 11S - 02-60 and 6-58	Not Required for Pipe Inspection
		Supplement	After Expansion
		Inspected 10 Inches From End	If Required Only 6" of End to be Inspected
14.	Plate Inspection	SEL - 072 - Class 3 & Class 1 Acceptance Criteria	Not Required
15.	Repairs of Dents With Gouges	Must be Cut - Out	Can Be Ground
16.	Weld Repairs	No Repair After Expansion	Not Specified
		Min. Repair Length 4"	Min. Repair Length 2"
		Total Number - 3 Total Length of Repair <5% Length of Pipe	Not Specified
		Distance Between Repair One Diameter	
		Repair Welds	Be Inspected
		Repair Welds to be 100% Radiographed	
17.	Storage and Handling	Such As To Minimize Damage And Corrosion	Not Specified
18.	Sulphide Stress Cracking Test	No Cracking At 72% SMYS In TM - 02 - 84 Solution	Not Required
19.	Hydrogen Induced Cracking Test	AIM CSR <1.50% In TM - 02 - 84 Solution	Not Required

Source: All American Pipeline Company.

REVISED TABLE 4-2

SENSITIVITY OF ALL AMERICAN PIPELINE LEAK DETECTION SYSTEM

Detection Time	Percent of Flow	Leak Rate at 300,000 barrels per day	Spill Volume at Time of Detection	Leak Rate at 450,000 barrels per day	Spill Volume at Time of Detection
1 minute	10	21 barrels per min	21.0 barrels	31	31.0
10 minutes	1	2.1 barrels per min	21.0 barrels	3.1	31.0
8 hours	0.2	0.4 barrels per min	192.0 barrels	0.6	288.0

Source: All American 1986.

NOTE: Across the Edwards Aquifer recharge zone, the leak detection sensitivity as proposed increases to 1 percent in 3 minutes and 0.3 percent in 10 minutes. This reduces the spill volume at the time of detection to about nine barrels at a flow rate of 450,000 bpd. These figures do not include the use of a continuous hydrocarbon sampling system.

TABLE 4-3a

SUMMARY OF LIQUID PIPELINE
INCIDENT REPORTS FROM 1970 to 1985

Cause (Crude Plus Product)	Average No. of Incidents Per Year	Percent of Total	Average Loss (Barrels/Year)	Percent Volume Lost	Average Loss Per Spill
Internal Corrosion	15	6.2	9,351	3.0	623.4
External Corrosion	56	23.1	32,959	10.6	588.6
Defective Weld	10	4.1	17,801	5.7	1,780.1
Incorrect Operation	16	6.6	23,870	7.7	1,491.9
Defective Pipe	11	4.5	24,431	7.8	2,221.0
Equipment Damage	71	29.2	83,523	26.8	1,176.4
Other	64	26.3	119,740	38.4	1,870.9
Total	243	100.0	311,675	100.0	---
Commodity					
Crude Oil	137	56.4	154,36	49.5	1,126.7

TABLE 4-6

SUMMARY OF EXPECTED SPILL FREQUENCIES AND SPILL VOLUMES FOR THE PROPOSED ROUTE

Spill frequency rate	4.017×10^{-4} spills per mile-year
Spill volume rate	1.506 barrels per mile-year
Route length	485.7 miles
Spill frequency	0.195 spills per year
Spill volume	731 barrels per year
Spills in 40 years	7.8
Volume in 40 years	29,259 barrels
Average spill size	3,751 barrels

TABLE 4-7

SUMMARY OF EXPECTED SPILL FREQUENCIES AND SPILL VOLUMES FOR THE PROPOSED ROUTE THROUGH THE EDWARDS AQUIFER RECHARGE ZONE

Spill frequency rate	2.246×10^{-4} spills per mile-year
Spill volume rate	0.601 barrels per mile-year
Route segment length	6.4 miles
Spill frequency	0.001 spills per year
Spill volume	4 barrels per year
Spills in 40 years	0.057
Probability of 1 or more spills in 40 years	6 percent
Average spill size	2,699 barrels

TABLE 4-8

SUMMARY OF EXPECTED SPILL FREQUENCIES AND SPILL VOLUMES AT SENSITIVE RECEPTORS FOR THE PROPOSED ROUTE

Receptor	Affected Mileage	Expected No. of Spills in 40 Years	Expected Spill Volume in 40 Years (barrels)[1]	Probability of One or More Spills in 40 Years (%)
Major Stream Crossings	7	0.11	422	11
Sensitive Aquifers	401	6.44	24,156	99.8
Agricultural lands	80	1.29	4,819	72
T&E[1] Species Habitat	60	0.96	3,614	62
Residential Areas	3	0.05	181	5

[1]Assuming an average spill size of 3,400 barrels.

[2]T&E = Threatened and Endangered

TABLE 4-26a

SUMMARY OF ANNUAL AIR QUALITY IMPACTS FROM
PUMP/HEATER OPERATIONS
PROPOSED ROUTE
(450,000 BPD)

Source Station	SO_2[1] Maximum Concentration ($\mu g/m^3$)	NO_x[1] Maximum Concentration ($\mu g/m^3$)	TSP[1] Maximum Concentration ($\mu g/m^3$)	Significant Annual Hourly Impact Level for SO_2, NO_x, TSP ($\mu g/m^3$)
McCamey	0.0035	0.5102	0.0278	1.0
Sonora	0.0065	0.8478	0.0465	1.0
Mountain Home	0.0029	0.4353	0.0234	1.0
Seguin	0.0069	0.8997	0.0483	1.0
Sheridan	0.0021	0.3276	0.0179	1.0

Source: ERT

[1]Federal and State Annual Standards: SO_2: 80 $\mu g/m^3$
NO_x: 100 $\mu g/m^3$
TSP: 75 $\mu g/m^3$

TABLE 4-27a

SUMMARY OF GENERIC SHORT-TERM AIR QUALITY IMPACTS FROM PUMP/HEATER OPERATIONS

PROPOSED ROUTE

(450,000 bpd)

Pollutant/ Averaging Period	Maximum[1] Concentration ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	Texas or Federal Standards ($\mu g/m^3$)
SO_2			
30-minute	<0.003 (ppm)	---	0.40 (ppm[1])
3-hour	<0.87	25.0	365[2]
24-hour	<0.87	5.0	1,300[2]
TSP			
1-hour	<6.8	---	400[1]
3-hour	<6.1	---	200[1]
5-hour	<6.1	---	100[1]
24-hour	<2.7	5.0	150[2]

Source: Radian 1986.

[1]Texas Standard.

[2]National Ambient Air Quality Standard.

REVISED TABLE 4-30

REGIONAL REFINERY EMISSION
ESTIMATES (TONS/YEAR)

	Air Pollutant			
	SO_2	NO_x	TSP	VOC
Total Regional Emissions[1]	293,956	465,238	733,353	390,450
Total Refinery Emissions[2]	144,401	110,191	142,248	127,035
Percent Refinery	49.1	23.7	19.4	32.5
Estimated Emissions Increase[3]:				
for 300,000 BPD	18,000	13,800	9,200	15,900
for 450,000 BPD	27,000	20,600	2,700	23,800
Percent increase in regional emissions:				
for 300,000 BPD	6.1	3.0	2.4	4.1
for 450,000 BPD	9.2	4.4	3.6	6.1

[1]TACB emissions inventory 1985.

[2]At 83.1 percent of capacity. Current capacity estimated at 2,896,001 BPD. (Oil and Gas Journal, October 1986).

[3]Based on a 12.5 and 18.7 percent increase in BPD refined.

REVISED TABLE 4-32

RECREATIONAL RESOURCES POTENTIALLY AFFECTED BY AN OIL SPILL

Resource	Reservoir	Impact
Proposed Route		
South Llano River[1]	Lake L.B.J.[1]	Fishing, waterskiing, swimming, boating
Pedernales River[1]	Lake Travis[1]	Fishing, waterskiing, swimming, boating
Colorado River [1,2]		Boating, fishing, hiking
Brazos River[1]		Boating, fishing, hiking
Clear Creek[2]		Boating, fishing, hiking
San Bernard River		Boating, fishing, hiking
Oyster Creek		Boating, fishing, hiking
Chocolate Bayou[2]		Some sport and commercial fishing; primary impact would
Mustang Bayou[2]		be flow of oil spill from streams into saltwater bays
Highland Bayou[2]		
Barton Springs		Swimming, tourist activities
San Marcos Springs		Boating, tourist activities
Gulf Bays[1,2] and Beach Areas		96 miles of accessible beach
• Galveston Bay		824,000 acres of saltwater bay, commercial and sport
• East Bay		fishing, sailing, waterskiing, swimming
• Trinity Bay		
• West Bay		
• Matagorda Bay		
Galveston Island State Park[1,2]		Swimming, fishing, boating, and other forms of recreation
Lyndon B. Johnson National Historic Park		Siteseeing
National Wildlife Refuges[1,2]		Research, birding, hunting, viewing
• Attwater Prairie Chicken		
• Anahuac		
• Brazoria River		
• San Bernard River		
• Big Boggy		
Priviate Resorts		
• Ezell's Cave		
• Caverns of Sonora,		Cave Viewing
Northern Alternative		
Colorado River[1,2]	Lake Buchanan[1]	Fishing, waterskiing, swimming, boating
Pecan Bayou		Fishing, boating
South Concho River	Twins Buttes[1]	Fishing, waterskiing, swimming, boating
Leon River	Belton Reservoir[1]	Fishing, waterskiing, swimming, boating
Lampasas River	Stillhouse Hollow[1]	Fishing, waterskiing, swimming, boating
South Bosque/Bosque Rivers[1]	Waco Lake[1]	Fishing, waterskiing, swimming, boating
Middle Yegua Creek	Lake Somerville[1]	Fishing, waterskiing, swimming, boating
East Yegua Creek	Lake Somerville[1]	Fishing, waterskiing, swimming, boating
Little/Brazos Rivers[1]		Fishing, hiking, swimming, boating
Gulf Bays and Beach Areas		
• Galveston Bay		Fishing, boating, swimming, water skiing, sailing
Southern Alternative		
Devil's River[1]	Amistad[1]	Fishing, boating, diving, camping, picnicking, natural area
Nueces River[1]	Upper Nueces[1]	Fishing, boating, diving, camping, picnicking, natural area
Frio River[1]	Choke Canyon	Fishing, boating, diving, camping, picnicking, natural area
Sabinal River	Choke Canyon	Fishing, boating, diving, camping, picnicking, natural area
Hondo Creek	Choke Canyon	Fishing, boating, diving, camping, picnicking, natural area
Cibolo Creek		Fishing, camping, hiking, natural area
Leona River	Choke Canyon	Fishing, boating, diving, camping, picnicking, natural area
San Antonio/Guadalupe Rivers[1]		Fishing, boating, camping, picnicking, natural area
Guadalupe River[1]		Fishing, boating, camping, picnicking, natural area
Lavaca River[1]	Lake Texana[1]	Fishing, boating, swimming, waterskiing, camping
Navidad River	Lake Texana[1]	Fishing, boating, swimming, waterskiing, camping
Colorado River [1,2]		Fishing, boating, swimming, camping, hiking
San Bernard		Boating, fishing, hiking
Brazos River		Boating, fishing, hiking
Gulf Bays and Beach Areas		
• San Antonio Bay		Fishing, boating, swimming, water skiing, sailing
• Matagorda Bay		Fishing, boating, swimming, water skiing, sailing
• Galveston Bay		Fishing, boating, swimming, water skiing, sailing

[1]Important recreational resource.

[2]These resources would also be affected on the Northern and Southern Alternatives.

TABLE 4-37

SUMMARY OF EXPECTED SPILL FREQUENCIES AND SPILL VOLUMES FOR THE NORTHERN ALTERNATIVE

Spill frequency rate	4.017×10^{-4} spills per mile-year
Spill volume rate	1.506 barrels per mile-year
Route length	545.7 miles
Spill frequency	0.219 spills per year
Spill volume	822 barrels per year
Spills in 40 years	8.8
Volume in 40 years	32,873 barrels
Average spill size	3,736 barrels

TABLE 4-38

SUMMARY OF EXPECTED SPILL FREQUENCIES AND SPILL VOLUMES AT SENSITIVE RECEPTORS FOR THE NORTHERN ALTERNATIVE

Receptor	Affected Mileage	Expected No. of Spills in 40 Years	Expected Spill Volume in 40 Years (barrels)	Probability of One or More Spills in 40 Years (%)
Major Stream Crossings	13	0.21	783	19
Sensitive Aquifers	335	5.38	20,180	99.5
Agricultural Lands	145	2.33	8,735	90
T & E Species Habitat	41	0.66	2,470	48
Residential Areas	3	0.05	181	5

REVISED TABLE 4-47

COMMUNITIES WITHIN COMMUTING DISTANCE OF PIPELINE CONSTRUCTION

NORTHERN ALTERNATIVE

Construction Pipeline Spread	Communities with Accommodations Within Close Proximity of the Pipeline	Overnight Rooms	Recreational Vehicle Sites[1]
1	McCamey	74	0
	Rankin	8	0
	Big Lake	98	12
	San Angelo	1,860	283
	Eden	18	NA[2]
	Coleman	99	164
	Santa Ana	12	37
	Brownwood	371	576
	Comanche	85	NA
	Goldthwaite	39	100
	Hamilton	65	NA
	Gatesville	102	12
	Lampasas	107	75
	McGregor	3	488
	Moody	0	6
2	Temple	1,263	344
	Camarron	81	10
	Rockdale	139	NA
	Taylor	148	NA
	Caldwell	169	345
	Giddings	214	118
	Brenham	337	324
	Bellville	48	550
	Sealy	75	200
	East Bernard	NA	NA
	Rosenberg	360	182
	Alvin	167	619
	Houston	32,066	858

Source: King 1986.

[1]Campsites do not necessarily correspond to communities; they occur within commuting distance of the pipeline in the same county as the communities listed.

[2]NA = Not Available

TABLE 4-49

SUMMARY OF EXPECTED SPILL FREQUENCIES AND SPILL VOLUMES FOR THE SOUTHERN ALTERNATIVE

Spill frequency rate	4.017×10^{-4} spills per mile-year
Spill volume rate	1.506 barrels per mile-year
Route length	537.8 miles
Spill frequency	0.216 spills per year
Spill volume	810 barrels per year
Spills in 40 years	8.6
Volume in 40 years	32,397 barrels
Average spill size	3,767 barrels

TABLE 4-50

SUMMARY OF EXPECTED SPILL FREQUENCIES AND SPILL VOLUMES AT SENSITIVE RECEPTORS FOR THE SOUTHERN ALTERNATIVE

Receptor	Affected Mileage	Expected No. of Spills in 40 Years	Expected Spill Volume in 40 Yeras (barrels)	Probability of One or More Spills in 40 Years (%)
Major Stream Crossings	17	0.27	1,024	24
Sensitive Aquifers	418	6.72	25,180	99.9
Agricultural Lands	117	1.88	7,048	85
T & E Species Habitat	26	0.42	1,566	34
Residential Areas	5	0.08	301	8

T & E = Threatened and Endangered

REVISED TABLE 4-57

WATER BODIES WHERE A MAJOR OIL SPILL ALONG THE SOUTHERN ALTERNATIVE COULD MEASURABLY AFFECT IMPORTANT FISH SPECIES[1]

Freshwater Species	Pinto Creek[2]	Devil's River	Amistad Reservoir	Las Moras Creek[2]	Nueces River	Upper Nueces Reservoir	Hondo Creek	Sabinal River	Frio River, Choke Canyon Reservoir	Cibolo Creek	San Antonio River	Guadalupe River	Lavaca River	Navidad River	Lake Texana	Colorado River	San Bernard River	Brazos River	Oyster Creek	Chocolate Bayou	Mustang Bayou	Clear Creek	Highland Bayou[3]
Sharpnose shiner*																X		X					
Smalleye shiner*																		X					
Smallmouth buffalo			X		X	X	X	X	X	X	X	X	X	X	X	X		X				X	
Blue catfish			X			X							X	X	X	X		X				X	
Black bullhead			X				X	X	X				X	X	X	X		X	X				
Yellow bullhead					X	X				X	X	X	X	X	X	X	X	X	X			X	
Channel catfish		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	
Flathead catfish			X			X	X	X	X	X	X	X	X	X	X	X		X					
White bass			X	X												X		X				X	
Striped bass													X	X	X	X		X					
Sunfishes		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Spotted bass													X	X	X		X	X					
Largemouth bass		X	X		X	X	X	X	X			X	X	X	X	X	X	X				X	
Smallmouth bass												X				X		X					
Crappies			X		X	X	X	X	X				X	X	X	X	X	X					
Freshwater drum			X			X	X	X	X				X	X	X	X		X					
Proserpine shiner*	X	X	X	X																			
Devil's River minnow*	X	X	X	X																			
Rio Grande darter*			X													X	X	X					
Greenthroat darter*				X								X											
Conchos pupfish*		X																					
Guadalupe bass*		X				X				X	X	X	X	X	X	X	X						
Blue Sucker*			X																				
Blotched gambusia*		X																					

Source: ERT.

[1]Important fish populations defined as sports, commercial, or threatened, endangered*, or special status species.

[2]Fish composition not known but expected to be similar to Devil's River.

[3]Fish composition not known but expected to be similar to Chocolate Bayou and Clear Creek.

REVISED TABLE 4-60

COMMUNITIES WITHIN COMMUTING DISTANCE OF PIPELINE CONSTRUCTION

SOUTHERN ALTERNATIVE

Construction Pipeline Spread	Communities with Accommodations Within Close Proximity of the Pipeline	Overnight Rooms	Recreational Vehicle Sites[1]
1	McCamey	74	0
	Rankin	8	0
	Ozona	116	0
	Sonora	155	14
	Del Rio	803	360
	Brackettville	62	NA[2]
	Uvalde	359	848
2	Devine	54	20
	San Antonio	15,641	1,529
	Poteet	6	0
	Floresville	24	0
	Seguin	324	79
	Nixon	12	137
	Cuero	80	16
	Yoakum	61	NA
	Hallettsville	118	23
	Shiner	8	NA
	East Bernard	NA	NA
	Rosenberg	360	182
	Alvin	167	619
	Houston	32,066	858

Source: King 1986.

[1]Campsites do not necessarily correspond to communities; they occur within commuting distance of the pipeline in the same county as the communities listed.

[2]NA = Not Available

TABLE 4-61a

POTENTIAL OIL SPILLS BY TANKERS

SHIPPING 300,000 BPD

Number of Spills[1]		Spill Volume >1,000 bbl	Spill Volume >10,000 bbl
Expected no. spills per year			
	At Sea	0.0985	0.0547
	In Port	0.0438	0.0164
Probability of one or more spills per year			
	At Sea	9.38%	5.33%
	In Port	4.29%	1.63%
Expected no. spills in 40 years			
	At Sea	3.942	2.190
	In Port	1.752	0.657
Probability of one or more spills in 40 years			
	At Sea	98.06%	88.81%
	In Port	82.66%	48.16%

[1]Spill statistics based on Lanfear & Amstutz (1983).

TABLE 4-61b

POTENTIAL OIL SPILLS BY TANKERS

SHIPPING 450,000 BPD

Number of Spills[1]		Spill Volume >1,000 bbl	Spill Volume >10,000 bbl
Expected no. spills per year			
	At Sea	0.1478	0.0821
	In Port	0.0657	0.0246
Probability of one or more spills per year			
	At Sea	13.7%	7.9%
	In Port	6.3%	2.4%
Expected no. spills in 40 years			
	At Sea	5.913	3.285
	In Port	2.628	0.985
Probability of one or more spills in 40 years			
	At Sea	99.7%	96.2%
	In Port	92.8%	62.7%

[1]Spill statistics based on Lanfear & Amstutz (1983).

TABLE A2-4

SPILL VOLUMES AT SENSITIVE RECEPTORS

Base Spill Rate = 1.506 barrel per mile-year

Receptor	Miles	Barrels Per Year	Barrels in 40 Years
		Proposed Route	
Streams	7	11	422
Aquifers	401	604	24,156
Ag. Lands	80	120	4,819
T&E Habitat	60	90	3,614
Residential	3	5	181
		Northern Alternative	
Streams	13	20	783
Aquifers	335	505	20,180
Ag. Lands	145	218	8,735
T&E Habitat	41	62	2,470
Residential	3	5	181
		Southern Alternative	
Streams	17	26	1,024
Aquifers	418	630	25,180
Ag. Lands	117	176	7,048
T&E Habitat	26	39	1,566
Residential	5	8	301

Note: These are statistical estimates. Actual spill volumes depend on a wide array of factors and may vary considerably from the statistical averages.

TABLE B4-1a

LOCATION OF SITE-SPECIFIC OIL SPILL CONTIGENCY PLANS

Proposed Route Location	Description of Resource at Risk	Resource Location
All resource locations with proposed remote-control block valves listed in Revised Table 4-62 will contain a site-specific Oil Spill Contigency Plan. Additional sites are listed below.		
Ozona municipal water supply	Groundwater resources	Within two miles of route
Sonora municipal water supply	Groundwater resources	Within two miles of route
Caverns of Sonora	Subterranean caverns	One mile south of route (See Map 2-2, sheet 2)
Kyle municipal water supply	Groundwater resources	Within two miles of route
Fredericksburg municipal water supply	Groundwater resources	Within two miles of route
Springlake and San Marcos River	Edwards Aquifer recharge zone; special status aquatic wildlife and plant species	Twelve miles from route (See Map 2-2, sheet 5)
Comal Springs	Special status fish species	Twenty miles south of route (See Map 2-2, sheet 5)
Weimer municipal water supply	Groundwater resources	Within two miles of route
Eagle Lake municipal water supply	Groundwater resources	Within two miles of route
East Bernard municipal water supply	Groundwater resources	Within two miles of route
Rosenburg municipal water supply	Groundwater resources	Within two miles of route
Bald eagle feeding and nesting sites	Bald eagle-federally endangered	Two areas: one southeast of Worthington Lake, another along the Brazos River. (See Map 2-2, sheet 8)
Mustang Bayou	Game fish species; Gulf Coast recreational resources	See Map 2-2, sheet 8
Clear Creek	Game fish species; Gulf Coast recreational resources	See Map 2-2, sheet 8
Alvin municipal water supply	Groundwater resources	Within two miles of route

Site-specific Oil Spill Contigency Plans will be prepared for coastal bays, estuaries, beaches, and refuges potentially impacted by an oil spill along an inland waterway. Applicable water crossings were addressed in Table 4-62, with additional sites listed above.

TABLE B4-1a (CONTINUED)

Northern Alternative Location	Description of Resource at Risk	Resource Location
All resource locations with proposed remote-control block valves listed in Revised Table 4-62 will contain a site-specific Oil Spill Contigency Plan. Additional sites are listed below.		
Rankin municipal water supply	Groundwater resources	Within two miles of route
Big Lake municipal water supply	Groundwater resources	Within two miles of route
Dove Creek	Special status and game fish species	See Map 2-3, sheet 2
McGregor municipal water supply	Groundwater resources	Within two miles of route
Big Elm Creek	Game fish species (similar to those of the Brazos River)	Entire perennial section of stream
Rockdale municipal water supply	Groundwater resources	Within two miles of route
Plum Creek, San Bernard River, and Attwater Greater Prairie Chicken National Wildlife Refuge	Houston toad and Attwater greater prairie chicken-federally endangered	South of route from intermittent Plum Creek to the San Bernard River intersecting the NWR.
Sealy municipal water supply	Groundwater resources	Within two miles of route
Wallis municipal water supply	Groundwater resources	Within two miles of route
Rabbs Bayou	Game fish species, bald eagle	Within entire stream
Rosenburg municipal water supply	Groundwater resources	Within two miles of route
Bald eagle feeding and nesting sites	Bald eagle-federally endangered	Two areas: one southeast of Worthington Lake, another along the Brazos River (See Map 2-3, sheet 9)
Mustang Bayou	Game fish species; Gulf Coast recreational resources	See Map 2-3, sheet 9
Clear Creek	Game fish species; Gulf Coast recreational resources	See Map 2-3, sheet 9
Alvin municipal water supply	Groundwater resources	Within two miles of route

Site-specific Oil Spill Contigency Plans will be prepared for coastal bays, estuaries, beaches, and refuges, potentially impacted by an oil spill along an inland waterway. Applicable water crossings were addressed in Table 4-62, with additional sites listed above.

TABLE B4-1a (CONTINUED)

Southern Alternative Location	Description of Resource at Risk	Resource Location
All resource locations with proposed remote-control block valves listed in Revised Table 4-62 will contain a site-specific Oil Spill Contigency Plan. Additional sites are listed below.		
Ozona municipal water supply	Groundwater resources	Within two miles of route
Pinto Creek	Special status fish species	See Map 2-4, sheet 3
Los Moras Creek	Special status and game fish species	See map 2-4, sheets 3 and 4
Bracketville municipal water supply	Groundwater resources	Within two miles of route
Leona River	Three Rivers municipal water supply, via Frio River; Choke Canyon recreational resources	See Maps 2-4, sheet 4
Uvalde municipal water supply	Groundwater resources	Within two miles of route
Hondo Creek	Three Rivers municipal water supply, via Frio River; Choke Canyon recreational resources	See Map 2-4, sheet 4
Devine municipal water supply	Groundwater resources	Within two miles of route
Natalia municipal water supply	Groundwater resources	Within two miles of route
Floresville municipal water supply	Groundwater resources	Within two miles of route
Cibolo Creek	Special status and game fish species; Gulf Coast recreational resources	See Map 2-4, sheet 6
Cuero municipal water supply	Groundwater resources	Within two miles of route
Wharton municipal water supply	Groundwater resources	Within two miles of route
Needville municipal water supply	Groundwater resources	Within two miles of route
Bald eagle feeding and nesting sites	Bald eagle-federally endangered	Two areas: one southeast of Worthington Lake, another along the Brazos River (See Map 2-4, sheet 9)
Mustang Bayou	Game fish species; Gulf Coast recreational resources	See Map 2-4, sheet 9
Clear Creek	Game fish species; Gulf Coast recreational resources	See Map 2-4, sheet 9
Alvin municipal water supply	Groundwater resources	Within two miles of route

Site-specific Oil Spill Contigency Plans will be prepared for coastal bays, estuaries, beaches, and refuges, potentially impacted by an oil spill along an inland waterway. Applicable water crossings were addressed in Table 4-62, with additional sites listed above.

REVISED TABLE E1-1

FISH SPECIES POTENTIALLY OCCURRING IN STREAMS AND DOWNSTREAM RESERVOIRS CROSSED BY THE PROPOSED ROUTE

Scientific Name	Common Name	Status[1]	South Llano River	Lake Lyndon B. Johnson	Pedernales River	Lake Travis	Colorado River	San Bernard River	Brazos River	Oyster Creek[2]	Chocolate Bayou	Mustang Bayou	Clear Creek
Lepisosteidae	Gars												
Atractosteus spatula	Alligator gar	NNG					X	X	X				
L. oculatus	Spotted gar	NNG					X	X	X		X	X	X
L. osseus	Longnose gar	NNG	X	X			X	X	X	X			
Amiidae	Bowfins												
Amia calva	Bowfin	NNG					X		X				
Anguillidae	Freshwater Eels												
Anguilla rostrata	American eel	G					X		X				
Clupeidae	Herring												
Alosa chrysochloris	Skipjack herring	NNG											X
Brevoortia gunteri	Finescale menhaden	NNG									X	X	X
Dorosoma cepedianum	Gizzard shad	NNG	X	X	X	X	X	X	X	X	X	X	X
D. petenense	Threadfin shad	NNG		X		X	X	X	X				X
Engraulidae	Anchovies												
Anchoa mitchilli	Bay anchovy	NNG									X	X	
Characidae	Characins												
Astyanax mexicanus	Mexican tetra	NNG	X		X		X		X				
Cyprinidae	Minnows and Carps												
Carassius auratus	Goldfish	NG		X			X		X				
Campostoma anomalum	Stoneroller	NNG	X				X	X	X				
Cyprinus carpio	Carp	NG	X	X	X	X	X	X	X				X
Dionda epsicopa	Roundnose minnow	NG	X										
Hybognathus nuchalis	Mississippi silvery minnow	NNG					X		X				
Hybopsis aestivalis	Speckled chub	NNG	X		X		X	X	X				
Notemigonus chrysoleucas	Golden shiner	NNG	X	X	X	X	X	X	X				
Notropis amabilis	Texas shiner	NNG	X				X		X				
N. amnis	Pallid shiner	NNG					X	X	X				
N. atherinoides	Emerald shiner	NNG					X	X	X				
N. atrocaudalis	Blackspot shiner	NNG					X		X				
N. buccula	Smalleye shiner	C							X				
N. buchanani	Ghost shiner	NNG					X	X	X				
N. chalybaeus	Ironcolor shiner	NNG					X		X				
N. deliciosus	Emerald shiner	NNG					X		X				
N. fumeus	Ribbon shiner	NNG					X	X	X				

REVISED TABLE E1-1 (CONTINUED)

Scientific Name	Common Name	Status[1]	South Llano River	Lake Lyndon B. Johnson	Pedernales River	Lake Travis	Colorado River	San Bernard River	Brazos River	Oyster Creek[2]	Chocolate Bayou	Mustang Bayou	Clear Creek
Cyprinidae (Continued)													
N. hudsonius	Spottail shiner	NNG					X		X				
N. lutrensis	Red shiner	NNG	X	X	X	X	X	X	X				
N. oxyrhyncus	Sharpnose shiner	C					X		X				
N. sabinal	Sabine shiner	NNG					X	X	X				
N. shumardi	Silverband shiner	NNG					X	X	X				
N. stramineus	Sand shiner	NNG	X		X								
N. texanus	Weed shiner	NNG					X	X	X				
N. venustus	Blacktail shiner	NNG	X	X	X	X	X	X					
N. volucellus	Mimic shiner	NNG	X		X		X	X	X				
Opsopoedus emiliae	Pugnose shiner	NNG					X	X	X				
Phenacobius mirabilis	Suckermouth minnow	NNG					X		X				
Pimphales promelas	Fathead minnow	NNG		X		X	X	X	X				
P. vigilax	Bullhead minnow	NNG	X	X	X		X	X					
Rhinichthys osculus	Speckled dace	NNG					X		X				
Catostomidae	Suckers												
Carpiodes carpio	River carpsucker	NNG	X	X	X	X	X	X	X				
Ictiobus bubalus	Smallmouth buffalo	NNG	X	X	X	X	X	X	X				X
Minytrema melanops	Spotted sucker	NNG	X		X		X	X	X				
Moxostoma congestum	Gray redhorse	NNG	X	X	X	X	X	X	X				
Ictaluridae	Catfishes												
Ictalurus furcatus	Blue catfish	G		X		X	X		X				X
I. melas	Black bullhead	G					X		X	X			
I. natalis	Yellow bullhead	G		X		X	X		X	X			X
I. punctatus	Channel catfish	G	X	X	X	X	X	X	X	X			X
Norturus gyrinus	Tadpole madtom	NNG		X			X	X					
Pylodictis olivaris	Flathead catfish	G	X	X	X	X	X	X	X				
*Satan eurystomas**	Widemouth blindcat	C											
*Trogloglanis pattersoni**	Toothless blindcat	C											
Cyprinodontidae	Killifishes												
Adinia xenica	Diamond killifish	NNG											X
Cyprinodon variegatus	Sheepshead minnow	NNG					X		X				
Fundulus chrysotus	Golden top-minnow	NNG					X		X				
F. grandis	Gulf killifish	NNG									X	X	
F. zebrinus	Plains killifish	NNG	X				X	X					
F. olivaceus	Blackspotted topminnow	NNG											
F. notatus	Blackstripe topminnow	NNG		X		X	X		X				

REVISED TABLE E1-1 (CONTINUED)

Scientific Name	Common Name	Status[1]	South Llano River	Lake Lyndon B. Johnson	Pedernales River	Lake Travis	Colorado River	San Bernard River	Brazos River	Oyster Creek[2]	Chocolate Bayou	Mustang Bayou	Clear Creek
Cyprinodontidae (Continued)													
Fundulus similis	Longnose killifish	NNG									X	X	
Lucania parva	Rainwater killifish	NNG					X		X				
Poeciliidae	Livebearers												
Gambusia affinis	Mosquitofish	NNG	X		X	X	X	X	X				
G. geiseri	Largespring mosquitofish	NNG			X								
Poecilia latipinna	Sailfin molly	NNG									X	X	
Atherinidae	Silversides												
Menidia audens	Mississippi silverside	NNG				X	X						
M. beryllina	Tidewater silverside	NNG		X			X		X				
Percichthyidae	Temperate basses												
Morone chrysops	White bass	G	X	X	X	X	X	X	X				X
M. saxatilis	Striped bass	G				X	X		X				
Centrarchidae	Sunfishes												
Ambloplites rupestris	Rockbass	G					X		X				
Lepomis auritis	Redbreast sunfish	G	X	X	X	X							
L. cyanellus	Green sunfish	G	X	X	X	X	X	X	X	X			X
L. gulosus	Warmouth	G	X	X	X		X	X	X				
L. humilis	Orangespotted sunfish	G	X			X	X		X				
L. macrochirus	Bluegill	G	X	X	X	X	X	X	X				X
L. marginatus	Dollar sunfish	G							X				
L. megalotis	Longear sunfish	G	X	X	X	X	X		X				
L. microlophus	Redear sunfish	G	X	X	X	X	X	X	X				
L. punctatus	Spotted sunfish	G		X			X	X	X				
L. symmetricus	Bantum sunfish	G					X		X				
Micropterus dolomieui	Smallmouth bass	G		X		X	X		X				
M. punctulatus	Spotted bass	G			X		X		X				
M. punctulatus x *M. treculi*	Spotted x Guadalupe hybrid	G		X	X	X							
M. salmoides	Largemouth bass	G	X	X		X	X	X	X				X
M. treculi	Guadalupe bass	G,C	X			X	X						
Pomoxis annularis	White crappie	G	X	X	X	X	X	X	X				
P. nigromaculatus	Black crappie	G	X		X			X	X				

REVISED TABLE E1-1 (CONTINUED)

Scientific Name	Common Name	Status[1]	South Llano River	Lake Lyndon B. Johnson	Pedernales River	Lake Travis	Colorado River	San Bernard River	Brazos River	Oyster Creek[2]	Chocolate Bayou	Mustang Bayou	Clear Creek
Percidae	True perches												
Etheostoma chlorosomum	Bluntnose darter	NNG					X	X	X				
E. gracile	Slough darter	NNG	X										
E. spectabile	Orangethroat darter	NNG	X				X		X				
Percina caprodes	Logperch	NNG	X	X		X	X		X				
P. macrolepida	Bigscale logperch	NNG	X				X		X				
P. sciera	Dusky darter	NNG					X	X	X				
Stizostedion canadense	Sauger	G											
S. vitreum vitreum	Walleye	G		X		X							
Sciaenidae	Drums												
Aplodinotus grunniens	Freshwater drum	G	X	X	X	X	X	X	X				
Bairdiella chrysura	Silver perch	G									X	X	
Cynoscion arenarius	Sand seatrout	G									X	X	
C. nebulosus	Spotted seatrout	G									X	X	
Micropogon undulatus	Atlantic croaker	G									X	X	
Pogonias cromis	Black drum	G									X	X	
Sciaenops ocellatus	Red drum	G									X	X	
Cichlidae	Cichlids												
Cichlasoma cyanoguttatum	Rio Grande perch	NG	X	X			X						
Tilapia mossambica	Mozambique tilapia	NG	X										
Mugilidae	Mullets												
Mugil cephalus	Striped mullet	G					X	X	X				X

Sources: Bonn (1980); Butler (1982, 1983); Hubbs (1982); Konkel and Winger (1974); Lee et al. (1980); Menn (1981); Moffett (1975); and Simmons (1986; in press).

*Species potentially occurring in Edwards Aquifer.

[1]Status: G = Gamefish; NG = nongamefish; NNG = native nongame fish; C = federal candidate.

[2]Limited fish information is based on fish kill observations. Fish fauna are expected to be similar to San Bernard and Brazos River.

REVISED TABLE E1-4

FISH SPECIES POTENTIALLY OCCURRING IN STREAMS AND DOWNSTREAM RESERVOIRS CROSSED BY THE NORTHERN ALTERNATIVE

Scientific Name	Common Name	Status[1]	Little River	Leon River	Belton Res.	Pecan Bayou	Lampasas River, Stillhouse Hollow Res.[2]	Colorado River	Lake Buchanan	South Concho River	Dove Creek	Twin Buttes Res.
Lepisosteidae	Gars											
Lepisosteus spatula	Alligator gar	NNG						X				
L. oculatus	Spotted gar	NNG			X		X	X				
L. osseus	Longnose gar	NNG			X		X	X	X			X
Amiidae	Bowfins											
Amia calva	Bowfin	NNG						X				
Anguillidae	Freshwater Eels											
Anguilla rostrata	American eel	G						X				
Clupeidae	Herring											
Alosa chrysochloris	Skipjack herring	NNG										
Brevoortia gunteri	Finescale menhaden	NNG										
Dorosoma cepedianum	Gizzard shad	NNG			X		X	X	X			X
D. petenense	Threadfin shad	NNG			X			X	X			X
Characidae	Characins											
Astyanax mexicanus	Mexican tetra	NNG						X	X			
Cyprinidae	Minnows and Carps											
Carassius auratus	Goldfish	NG						X	X			
Campostoma anomalum	Stoneroller	NNG			X			X				
Cyprinus carpio	Carp	NG			X		X	X	X			X
Hybognathus nuchalis	Mississippi silvery minnow	NNG						X				
Hybopsis aestivalis	Speckled chub	NNG						X				
Notemigonus chrysoleucas	Golden shiner	NNG		X	X		X	X	X	X	X	X
Notropis amabilis	Texas shiner	NNG						X				
N. amnis	Pallid shiner	NNG						X				
N. atherinoides	Emerald shiner	NNG						X				
N. atrocaudalis	Blackspot shiner	NNG						X	X			
N. buccala	Smalleye shiner	C										
N. buchanani	Ghost shiner	NNG						X				
N. chalybaeus	Ironcolor shiner	NNG						X				
N. deliciosus	Emerald shiner	NNG						X				
N. fumeus	Ribbon shiner	NNG						X				

REVISED TABLE E1-4 (CONTINUED)

Scientific Name	Common Name	Status[1]	Little River	Leon River	Belton Res.	Pecan Bayou	Lampasas River, Stillhouse Hollow Res.[2]	Colorado River	Lake Buchanan	South Concho River	Dove Creek	Twin Buttes Res.
Cyprinidae (Continued)												
N. hudsonius	Spottail shiner	NNG						X				
N. lutrensis	Red shiner	NNG	X	X	X		X	X	X	X	X	X
N. oxyrhyncus	Sharpnose shiner	C						X				
N. sabinal	Sabine shiner	NNG						X				
N. shumardi	Silverband shiner	NNG						X				
N. texanus	Weed shiner	NNG						X				
N. venustus	Blacktail shiner	NNG	X	X	X		X	X	X	X	X	X
N. volucellus	Mimic shiner	NNG						X				
Opsopoedus emiliae	Pugnose shiner	NNG						X				
Phenacobius mirabilis	Suckermouth minnow	NNG						X				
Pimphales promelas	Fathead minnow	NNG						X	X			
P. vigilax	Bullhead minnow	NNG		X	X		X	X	X	X	X	X
Rhinichthys osculus	Speckled dace	NNG						X				
Catostomidae	Suckers											
Carpiodes carpio	River carpsucker	NNG	X	X	X		X	X	X			X
Ictiobus bubalus	Smallmouth buffalo	NNG			X		X	X	X			
Minytrema melanops	Spotted sucker	NNG						X				
Moxostoma congestum	Gray redhorse	NNG	X	X	X		X	X				X
Ictaluridae	Catfishes											
Ictalurus furcatus	Blue catfish	G						X				
I. melas	Black bullhead	G					X	X				
I. natalis	Yellow bullhead	G	X	X	X		X	X	X			
I. punctatus	Channel catfish	G	X	X	X	X	X	X	X	X	X	X
Norturus gyrinus	Tadpole madtom	NNG	X	X	X		X	X		X	X	X
N. nocturnus	Freckled catfish	NNG										
Pylodictis olivaris	Flathead catfish	G	X	X	X	X	X	X	X	X	X	X
Cyprinodontidae	Killifishes											
Cyprinodon variegatus	Sheepshead minnow	NNG						X				
Fundulus chrysotus	Golden topminnow	NNG						X				
F. zebrinus	Plains killifish	NNG						X	X			
F. olivaceus	Blackspotted topminnow	NNG										
F. notatus	Blackstripe topminnow	NNG			X		X	X				

REVISED TABLE E1-4 (CONTINUED)

Scientific Name	Common Name	Status[1]	Little River	Leon River	Belton Res.	Pecan Bayou	Lampasas River, Stillhouse Hollow Res.[2]	Colorado River	Lake Buchanan	South Concho River	Dove Creek	Twin Buttes Res.
Cyprinodontidae (Continued)												
Lucania parva	Rainwater killifish	NNG						X				X
Poeciliidae	Livebearers											
Gambusia affinis	Mosquitofish	NNG			X		X	X	X			
Atherinidae	Silversides											
Labidesthes sicculus	Brook silverside	NNG						X				
Menidia beryllina	Tidewater silverside	NNG			X		X	X	X			X
M. audens	Mississippi silverside	NNG						X				
Percichthyidae	Temperate basses											
Morone chrysops	White bass	G		X	X		X	X	X			X
M. saxatilis	Striped bass	G						X	X			X
Centrarchidae	Sunfishes											
Ambloplites rupestris	Rockbass	G						X				
Lepomis auritis	Redbreast sunfish	G							X			X
L. cyanellus	Green sunfish	G	X	X	X		X	X	X			
L. gulosus	Warmouth	G	X	X	X	X	X	X		X	X	X
L. humilis	Orangespotted sunfish	G	X	X	X	X	X	X		X	X	X
L. macrochirus	Bluegill	G	X	X	X	X	X	X	X	X	X	X
L. marginatus	Dollar sunfish	G										
L. megalotis	Longear sunfish	G	X	X	X	X	X	X	X	X	X	X
L. microlophus	Redear sunfish	G	X	X	X	X	X	X	X	X	X	X
L. punctatus	Spotted sunfish	G						X	X			
L. symmetricus	Bantum sunfish	G						X				
Micropterus dolomieui	Smallmouth bass	G	X	X	X		X	X				
M. punctulatus	Spotted bass	G					X	X				
M. salmoides	Largemouth bass	G	X	X	X	X	X	X	X	X	X	X
M. treculi	Guadalupe bass	G,C						X	X	X	X	
Pomoxis annularis	White crappie	G	X	X	X		X	X	X	X	X	X
P. nigromaculatus	Black crappie	G					X	X				
Percidae	True perches											
Etheostoma chlorosomum	Bluntnose darter	NNG	X	X	X			X				
E. gracile	Slough darter	NNG						X				
E. lepidum	Greenthroat darter	NNG								X	X	
E. spectabile	Orangethroat darter	NNG						X	X			
Percina caprodes	Logperch	NNG	X	X	X			X				X
P. macrolepida	Bigscale logperch	NNG						X				
P. sciera	Dusky darter	NNG	X	X	X			X				
Stizostedion canadense	Sauger	G	X	X	X							
S. vitreum vitreum	Walleye	G					X					

REVISED TABLE E1-4 (CONTINUED)

Scientific Name	Common Name	Status[1]	Little River	Leon River	Belton Res.	Pecan Bayou	Lampasas River, Stillhouse Hollow Res.[2]	Colorado River	Lake Buchanan	South Concho River	Dove Creek	Twin Buttes Res.
Sciaenidae	Drums											
Aplodinotus grunniens	Freshwater drum	G			X		X	X	X			X
Cichlidae	Cichlids											
Cichlasoma cyanoguttatum	Rio Grande perch	NG						X	X			
Mugilidae	Mullets											
Mugil cephalus	Striped mullet	NNG						X				
Bothidae	Lefteye Flounders											
Paralichthys lethostigma	Southern flounder	G										

Source: Bonn (1980); Broadbent et al. (1986); Butler (1976); Follis (1981); Hubbs (1982); Mitchell et al. (1986); Simmons (In press, 1986).

[1]Status: G = Gamefish; NG = nongamefish; NNG = native nongame fish; C = federal candidate.

[2]Fish occurrence is based on studies in Stillhouse Hollow Reservoir. Fish composition in the Lampasas River is expected to be similar to the reservoir.

REVISED TABLE E1-5

FISH SPECIES POTENTIALLY OCCURRING IN STREAMS AND DOWNSTREAM RESERVOIRS CROSSED BY THE NORTHERN ALTERNATIVE

Scientific Name	Common Name	Status[1]	Clear Creek	Highland Bayou[2]	Mustang Bayou	Chocolate Bayou	Oyster Creek[3]	Brazos River	South Bosque Creek	Waco Lake	East & West Yegua Creeks	Somerville Lake
Lepisosteidae	Gars											
Lepisosteus spatula	Alligator gar	NNG					X					
L. oculatus	Spotted gar	NNG	X		X	X		X		X		X
L. osseus	Longnose gar	NNG						X		X		X
Amiidae	Bowfins											
Amia calva	Bowfin	NNG						X				
Anguillidae	Freshwater Eels											
Anguilla rostrata	American eel	G						X				
Elopidae	Tarpons											
Elops saurus	Ladyfish	NNG			X	X						
Clupeidae	Hering											
Alosa chrysochloris	Skippack herring	NNG	X									
Brevoortia gunteri	Finescale menhaden	NNG	X		X	X						
Dorosoma cepedianum	Gizzard shad	NNG	X		X	X	X	X		X		X
D. petenense	Threadfin shad	NNG	X					X		X		X
Characidae	Characins											
Astyanax mexicanus	Mexican tetra	NNG						X				
Cyprinidae	Minnows and Carps											
Carassius auratus	Goldfish	NG						X				
Campostoma anomalum	Stoneroller	NNG						X				
Cyprinus carpio	Carp	NG	X					X		X		X
Hybognathus nuchalis	Mississippi silvery minnow	NNG						X				
Hybopsis aestivalis	Speckled chub	NNG						X				
Notemigonus chrysoleucas	Golden shiner	NG						X		X		X
Notropus amabilis	Texas shiner	NNG						X				
N. amnis	Pallid shiner	NNG						X				
N. atherinoides	Emerald shiner	NNG						X				
N. atrocaudalis	Blackspot shiner	NNG						X		X		
N. buccala	Smalleye shiner	C						X				
N. buchanani	Ghost shiner	NNG						X				
N. chalybaeus	Ironcolor shiner	NNG						X				
N. deliciosus	Emerald shiner	NNG						X				
N. fumeus	Ribbon shiner	NNG						X				
N. hudsonius	Spottail shiner	NNG						X				
N. lutrensis	Red shiner	NNG						X		X		

REVISED TABLE E1-5 (CONTINUED)

Scientific Name	Common Name	Status[1]	Clear Creek	Highland Bayou[2]	Mustang Bayou	Chocolate Bayou	Oyster Creek[3]	Brazos River	South Bosque Creek	Waco Lake	East & West Yegua Creeks	Somerville Lake
Cyprinidae (Continued)												
N. oxyrhyncus	Sharpnose shiner	C						X				
N. sabinal	Sabine shiner	NNG						X				
N. shumardi	Silver band shiner	NNG						X				
N. texanus	Weed shiner	NNG						X				
N. venustus	Blacktail shiner	NNG								X		
N. volucellus	Mimic shiner	NNG						X				
Opsopoedus emiliae	Pugnose shiner	NNG						X				X
Phenacobius mirabilis	Suckermouth minnow	NNG						X				
Pimphales promelas	Fathead minnow	NNG						X				
P. vigilax	Bullhead minnow	NNG								X		X
Rhinichthys osculus	Speckled dace	NNG						X				
Catostomidae	Suckers											
Carpiodes carpio	River carpsucker	NNG						X		X		
Ictiobus bubalus	Smallmouth buffalo	NNG	X					X		X		X
Minytrema melanops	Spotted sucker	NNG						X				
Moxostoma congestum	Gray redhorse	NNG						X		X		
Ictaluridae	Catfishes											
Ictalurus furcatus	Blue catfish	G	X					X				
I. melas	Black bullhead	G					X	X		X		X
I. natalis	Yellow bullhead	G	X				X	X		X		X
I. punctatus	Channel catfish	G	X				X	X		X		X
Norturus gyrinus	Tadpole madtom	NNG						X				
N. nocturnus	Freckled catfish	NNG						X		X		X
Pylodictis olivaris	Flathead catfish	G						X		X		X
Cyprinodontidae	Killifishes											
Adinia xenica	Diamond killifish	NNG	X		X							
Cyprinodon variegatus	Sheepshead minnow	NNG			X	X		X				X
Fundulus chrysotus	Golden topminnow	NNG					X					
F. grandis	Gulf killifish	NNG			X	X						
F. zebrinus	Plains killifish	NNG						X				
F. olivaceus	Blackspotted topminnow	NNG										X
F. notatus	Blackstripe topminnow	NNG						X		X		X
F. similis	Longnose killifish	NNG			X	X						
Lucania parva	Rainwater killifish	NNG						X				
Poeciliidae	Livebearers											
Gambusia affinis	Mosquitofish	NNG				X		X	X			
Poecilia latipinna	Sailfin molly	NNG			X	X						

REVISED TABLE E1-5 (CONTINUED)

Scientific Name	Common Name	Status[1]	Clear Creek	Highland Bayou[2]	Mustang Bayou	Chocolate Bayou	Oyster Creek[3]	Brazos River	South Bosque Creek	Waco Lake	East & West Yegua Creeks	Somerville Lake
Atherinidae	Silversides											
Labidesthes sicculus	Brook silverside	NNG						X		X		
Menidia beryllina	Tidewater silverside	NNG						X				X
Percichthyidae	Temperate basses											
Morone chrysops	White bass	G	X					X		X		X
M. saxatilis	Striped bass	G						X				
Centrarchidae	Sunfishes				X	X	X					
Ambloplites rupestris	Rockbass	G						X				
Lepomis auritis	Redbreast sunfish	G										
L. cyanellus	Green sunfish	G	X				X	X		X		X
L. gulosus	Warmouth	G			X	X		X		X		X
L. humilis	Orangespotted sunfish	G						X		X		X
L. macrochirus	Bluegill	G	X					X		X		X
L. marginatus	Dollar sunfish	G						X				X
L. megalotis	Longear sunfish	G						X		X		X
L. microlophus	Redear sunfish	G	X					X		X		X
L. punctatus	Spotted sunfish	G						X				X
L. symmetricus	Bantum sunfish	G						X				X
Micropterus dolomieui	Smallmouth bass	G						X				
M. punctulatus	Spotted bass	G						X		X		
M. salmoides	Largemouth bass	G	X					X		X		X
M. treculi	Guadalupe bass	G,C							X	X	X	
P. nigromaculatis	Black crappie	G						X				X
Percidae	True perches											
Etheostoma chlorosomum	Bluntnose darter	NNG						X				
E. gracile	Slough darter	NNG						X				
E. spectabile	Orangethroat darter	NNG						X				
Percina caprodes	Logperch	NNG								X		X
P. macrolepida	Bigscale logperch	NNG						X				X
P. sciera	Dusky darter	NNG						X				
Stizostedion canadense	Sauger	G										
S. vitreum vitreum	Walleye	G								X		
Sciaenidae	Drums											
Aplodinotus grunniens	Freshwater drum	G						X		X		X
Bairdiella chrysura	Silver perch	G			X	X						
Cynoscion arenarius	Sand seatrout	G			X	X						
C. nebulosus	Spotted seatrout	G			X	X						
Micropogon undulatus	Atlantic croaker	G			X	X						
Pogonias cromis	Black drum	G			X	X						
Sciaenops ocellatus	Red drum	G			X	X						

REVISED TABLE E1-5 (CONTINUED)

Scientific Name	Common Name	Status[1]	Clear Creek	Highland Bayou[2]	Mustang Bayou	Chocolate Bayou	Oyster Creek[3]	Brazos River	South Bosque Creek	Waco Lake	East & West Yegua Creeks	Somerville Lake
Cichlidae	Cichlids											
Cichlasoma cyanoguttatum	Rio Grande perch	NG						X				
Mugilidae	Mullets											
Mugil cephalus	Striped mullet	G	X		X	X		X				
Bothidae	Lefteye Flounders											
Paralichthys lethestigma	Southern flounder	G	X		X	X						

Sources: Hubbs (1982); Konkel and Winger (1974); McCabe (1976); Menn (1984); Moffett (1983); Sellers (1986); Simmons (In press).

[1]Status: G = Gamefish; NG = nongamefish; NNG = native nongame fish; C = federal candidate.

[2]No fish distribution information is available. Fish fauna are expected to be similar to Mustang and Chocolate Bayous.

[3]Limited fish information is based on fish kill observations. Fish fauna are expected to be similar to San Bernard and Brazos River.

REVISED TABLE E1-6

FISH SPECIES POTENTIALLY OCCURRING IN STREAMS AND DOWNSTREAM RESERVOIRS CROSSED BY THE NORTHERN ALTERNATIVE

Scientific Name	Common Name	Status[1]	Pinto Creek[2]	Devil's River	Amistad Reservoir	Las Moras Creek[2]	Upper Nueces & Boynton Res.	Nueces River	Hondo Creek, Sabinal River, Frio River, Choke Canyon Res.	Cibolo Creek, San Antonio River	Guadalupe River
Lepisosteidae	Gars										
Lepisosteus spatula	Alligator gar	NNG			X		X		X		
L. oculatus	Spotted gar	NNG			X		X		X	X	
L. osseus	Longnose gar	NNG		X	X		X		X	X	X
Amiidae	Bowfins										
Amia calva	Bowfin	NNG									
Anguillidae	Freshwater Eels										
Anguilla rostrata	American eel	G									
Clupeidae	Herring										
Alosa chrysochloris	Skipjack herring	NNG									
Brevoortia gunteri	Finescale menhaden	NNG									
Dorosoma cepedianum	Gizzard shad	NNG		X	X		X	X	X	X	X
D. petenense	Threadfin shad	NNG		X	X			X			
Engraulidae	Anchovies										
Anchoa mitchilli	Bay anchovie	NNG									
Salmonidae	Trouts										
Salmo gairdneri	Rainbow trout										X
Characidae	Characins										
Astyanax mexicanus	Mexican tetra	NNG		X	X		X			X	X
Cyprinidae	Minnows and Carps										
Carassius auratus	Goldfish	NG									
Campostoma anomalum	Stoneroller	NNG		X	X		X				X
Cyprinus carpio	Carp	NG		X	X		X				
Dionda episcops	Roundnose minnow	NNG		X	X		X				X
D. diaboli	Devil's River minnow	NNG,C,TT		X	X	X					
Hybognathus nuchalis	Mississippi silvery minnow	NNG			X			X			
H. placita	Plains minnow	NNG			X						
Hybopsis aestivalis	Speckled chub	NNG			X						X
Notemigonus chrysoleucas	Golden shiner	NG			X		X				X

REVISED TABLE E1-6 (CONTINUED)

Scientific Name	Common Name	Status[1]	Pinto Creek[2]	Devil's River	Amistad Reservoir	Las Moras Creek[2]	Upper Nueces & Boynton Res.	Nueces River	Hondo Creek, Sabinal River, Frio River, Choke Canyon Res.	Cibolo Creek, San Antonio River	Guadalupe River
Cyprinidae (Continued)											
Notropis amabilis	Texas shiner	NNG		X	X		X	X		X	X
N. amnis	Pallid shiner	NNG									
N. atherinoides	Emerald shiner	NNG									
N. atrocaudalis	Blackspot shiner	NNG									
N. braytoni	Tamaulipas shiner	NNG			X						
N. brazosensis	Brazos River shiner	NNG									
N. buccala	Smalleye shiner	C									
N. buchanani	Ghost shiner	NNG									
N. chalybaeus	Ironcolor shiner	NNG									
N. deliciosus	Emerald shiner	NNG									
N. fumeus	Ribbon shiner	NNG									
N. hudsonius	Spottail shiner	NNG									
N. jemezanus	Rio Grande shiner	NNG		X	X						
N. lutrensis	Red shiner	NNG			X		X		X	X	X
N. oxyrhyncus	Sharpnose shiner	C									
N. proserpinus	Proserpine shiner	NNG,C,TT	X	X	X	X					
N. sabinae	Sabine shiner	NNG									
N. shumardi	Silverband shiner	NNG									
N. stramineus	Sand shiner	NNG		X	X						
N. texanus	Weed shiner	NNG					X				
N. umbratilis	Redfin shiner	NNG			X						
N. venustus	Blacktail shiner	NNG		X	X		X	X			X
N. volucellus	Mimic shiner	NNG		X	X					X	
Opsopoedus emiliae	Pugnose shiner	NNG						X	X	X	
Phenacobius mirabilis	Suckermouth minnow	NNG			X						
Pimephales promelas	Fathead minnow	NNG									
P. vigilax	Bullhead minnow	NNG		X	X		X	X	X		X
Rhinichthys osculus	Speckled dace	NNG			X						
Catostomidae	Suckers										
Carpiodes carpio	River carpsucker	NNG		X	X		X				
Cycleptus elongatus	Blue sucker	G,C,TT			X						
Ictiobus bubalus	Smallmouth buffalo	G			X		X	X	X	X	X
Minytrema melanops	Spotted sucker	NNG			X						
Moxostoma congestum	Gray redhorse	NNG		X	X		X			X	X

REVISED TABLE E1-6 (CONTINUED)

Scientific Name	Common Name	Status[1]	Pinto Creek[2]	Devil's River	Amistad Reservoir	Las Moras Creek[2]	Upper Nueces & Boynton Res.	Nueces River	Hondo Creek, Sabinal River, Frio River, Choke Canyon Res.	Cibolo Creek, San Antonio River	Guadalupe River
Ictaluridae	Catfishes										
Ictalurus furcatus	Blue catfish	G			X		X				
I. melas	Black bullhead	G			X				X		
I. natalis	Yellow bullhead	G					X	X		X	X
I. punctatus	Channel catfish	G		X	X		X	X	X	X	X
Noturus gyrinus	Tadpole madtom	NNG						X			
N. nocturnus	Freckled catfish	NNG									
Pylodictis olivaris	Flathead catfish	G			X		X		X	X	
Cyprinodontidae	Killifishes										
Cyprinodon eximius	Conchos pupfish	NNG,C,TT		X							
Cyprinodon variegatus	Sheepshead minnow	NNG									
Fundulus chrysotus	Golden topminnow	NNG									
F. grandis	Gulf killifish	NNG									
F. zebrinus	Plains killifish	NNG			X						
F. olivaceus	Blackspotted topminnow	NNG									
F. notatus	Blackstripe topminnow	NNG									
Lucania parva	Rainwater killifish	NNG									
Poeciliidae	Livebearers										
Gambusia affinis	Mosquitofish	NNG		X	X		X	X	X	X	X
G. senilis	Blotched gambusia	C, TT		X							
Poecilia latipinna	Sailfin molly	NNG					X	X		X	X
Atherinidae	Silversides										
Labidesthes sicculus	Brook silverside	NNG		X	X		X	X	X	X	X
Menidia beryllina	Tidewater silverside	NNG		X			X	X			X
M. martinica	Rough silverside	NNG			X						
Percichthyidae	Temperate Basses										
Morone chrysops	White bass	G			X	X					
M. saxatilis	Striped bass	G									
Centrarchidae	Sunfishes										
Ambloplites rupestris	Rockbass	G									
Lepomis auritis	Redbreast sunfish	G		X	X		X				X
L. cyanellus	Green sunfish	G		X	X		X		X	X	X
L. gulosus	Warmouth	G		X	X		X	X		X	
L. humilis	Orange-spotted sunfish	G									

REVISED TABLE E1-6 (CONTINUED)

Scientific Name	Common Name	Status[1]	Pinto Creek[2]	Devil's River	Amistad Reservoir	Las Moras Creek[2]	Upper Nueces & Boynton Res.	Nueces River	Hondo Creek, Sabinal River, Frio River, Choke Canyon Res.	Cibolo Creek, San Antonio River	Guadalupe River
Centrarchidae (Continued)											
L. macrochirus	Bluegill	G		X	X		X	X	X	X	X
L. marginatus	Dollar sunfish	G									
L. megalotis	Longear sunfish	G		X			X	X	X	X	X
L. microlophus	Redear sunfish	G		X	X			X	X		X
L. punctatus	Spotted sunfish	G					X			X	
L. symmetricus	Bantam sunfish	G									
Micropterus dolomieui	Smallmouth bass	G									X
M. punctulatus	Spotted bass	G									
M. salmoides	Largemouth bass	G		X	X		X	X	X		X
M. treculi	Guadalupe bass	G,C		X			X			X	X
Pomoxis annularis	White crappie	G			X		X	X	X	X	
P. nigromaculatus	Black crappie	G			X					X	
Percidae	True Perches										
Etheostoma chlorosomum	Bluntnose darter	NNG									
E. gracile	Slough darter	NNG									
E. grahami	Rio Grande darter	NNG,C,TT			X						
E. lepidum	Greenthroat darter	NNG,C				X					X
E. spectabile	Orangethroat darter	NNG		X							X
Percina caprodes	Logperch	NNG		X	X						X
P. macrolepida	Bigscale logperch	NNG									
P. sciera	Dusky darter	NNG									
Scianeidae	Drums										
Aplodinotus grunniens	Freshwater drum	G			X		X		X		
Bairdiella chrysura	Silver perch	G									
Cynoscion arenarius	Sand seatrout	G									
C. nebulosus	Spotted seatrout	G									
Micropogenias undulatus	Atlantic croaker	G									
Pogonias cromis	Black drum	G									
Sciaenops ocellata	Red drum	G									

REVISED TABLE E1-6 (CONTINUED)

Scientific Name	Common Name	Status[1]	Pinto Creek[2]	Devil's River	Amistad Reservoir	Las Moras Creek[2]	Upper Nueces & Boynton Res.	Nueces River	Hondo Creek, Sabinal River, Frio River, Choke Canyon Res.	Cibolo Creek, San Antonio River	Guadalupe River
Cichlidae	Cichlids										
Chichlasoma cyanoguttatum	Rio Grande perch	NG		X	X		X	X	X	X	X
Mugilidae	Mullets										
Mugil cephalus	Striped mullet	NNG						X			

Sources: Davis (1980); Dean (1978); Follis (1973); Harrell (1978); Hubbs et al. (1953; 1978); McCabe (1970); Simmons (in press); TPWD (1976); and Zerr (1979, 1981).

[1]Status: G = gamefish; NG = nongame fish; NNG = native nongame fish; C = federal candidate; TT = Texas threatened (protected nongame).

[2]No fish distribution information is available. Fish fauna are expected to be similar to the Devil's River drainage.

REVISED TABLE E1-7

FISH SPECIES POTENTIALLY OCCURRING IN STREAMS AND DOWNSTREAM RESERVOIRS CROSSED BY THE SOUTHERN ALTERNATIVE

Scientific Name	Common Name	Status[1]	Lavaca and Navidad Rivers, Lake Texana[2]	Colorado River	San Bernard River	Brazos River	Oyster Creek[3]	Chocolate, Mustang, and Highland Bayous[4]	Clear Creek
Lepisosteidae	Gars								
Lepisosteus spatula	Alligator gar	NNG	X	X	X	X			
L. oculatus	Spotted gar	NNG	X	X	X	X		X	X
L. osseus	Longnose gar	NNG	X	X	X	X			
Amiidae	Bowfins								
Amia calva	Bowfin	NNG		X		X			
Anguillidae	Freshwater Eels								
Anguilla rostrata	American eel	G		X		X			
Clupeidae	Herring								
Alosa chrysochloris	Skipjack herring	NNG							X
Brevoortia gunteri	Finescale menhaden	NNG						X	X
Dorosoma cepedianum	Gizzard shad	NNG	X	X	X	X	X	X	X
D. petenense	Threadfin shad	NNG	X	X		X			X
Engraulldae	Anchovies								
Anchoa mitchilli	Bay anchovy	NNG						X	
Characidae	Characins								
Astyanax mexicanus	Mexican tetra	NNG		X		X			
Cyprinidae	Minnows and Carps								
Carassius auratus	Goldfish	NG	X	X		X			
Campostoma anomalum	Stoneroller	NNG		X		X			
Cyprinus carpio	Carp	NG		X		X			X
Dionda episcops	Roundnose minnow	NNG							
D. diaboli	Devil's River minnow	NNG,C,TT							
Hybognathus nuchalis	Mississippi silvery minnow	NNG		X		X			
H. placita	Plains minnow	NNG							
Hybopsis aestivalis	Speckled chub	NNG		X		X			
Notemigonus chrysoleucas	Golden shiner	NNG	X	X	X	X			

REVISED TABLE E1-7 (CONTINUED)

Scientific Name	Common Name	Status[1]	Lavaca and Navidad Rivers, Lake Texana[2]	Colorado River	San Bernard River	Brazos River	Oyster Creek[3]	Chocolate, Mustang, and Highland Bayous[4]	Clear Creek
Cyprinidae (Continued)									
Notropis amabilis	Texas shiner	NNG	X	X		X			
N. amnis	Pallid shiner	NNG		X	X	X			
N. atherinoides	Emerald shiner	NNG		X	X	X			
N. atrocaudalis	Blackspot shiner	NNG		X		X			
N. buccala	Smalleye shiner	C				X			
N. buchanani	Ghost shiner	NNG		X		X			
N. brazosensis	Brazos River shiner	NNG			X				
N. chalybaeus	Ironcolor shiner	NNG		X		X			
N. deliciosus	Emerald shiner	NNG		X		X			
N. fumeus	Ribbon shiner	NNG	X	X	X	X			
N. hudsonius	Spottail shiner	NNG		X	X	X			
N. jemezanus	Rio Grande shiner	NNG		X	X	X			
N. lutrensis	Red shiner	NNG	X	X	X	X			
N. oxyrhyncus	Sharpnose shiner	C		X		X			
N. sabinae	Sabine shiner	NNG		X		X			
N. shumardi	Silverband shiner	NNG		X		X			
N. stramineus	Sand shiner	NNG	X						
N. texanus	Weed shiner	NNG	X	X	X	X			
N. umbratilis	Redfin shiner	NNG	X						
N. venustus	Blacktail shiner	NNG	X	X		X			
N. volucellus	Mimic shiner	NNG			X				
Opsopoedus emiliae	Pugnose shiner	NNG	X	X	X	X			
Phenacobius mirabilis	Suckermouth minnow	NNG		X		X			
Pimephales promelas	Fathead minnow	NNG		X		X			
P. vigilax	Bullhead minnow	NNG	X	X	X				
Rhinichthys osculus	Speckled dace	NNG		X	X	X			
Catostomidae	Suckers								
Carpiodes carpio	River carpsucker	NNG	X	X	X	X			
Ictiobus bubalus	Smallmouth buffalo	G	X	X		X			X
Minytrema melanops	Spotted sucker	NNG		X		X			
Moxostoma congestum	Gray redhorse	NNG		X		X			

REVISED TABLE E1-7 (CONTINUED)

Scientific Name	Common Name	Status[1]	Lavaca and Navidad Rivers, Lake Texana[2]	Colorado River	San Bernard River	Brazos River	Oyster Creek[3]	Chocolate, Mustang, and Highland Bayous[4]	Clear Creek
Ictaluridae	Catfishes								
Ictalurus furcatus	Blue catfish	G	X	X		X			X
I. melas	Black bullhead	G	X	X		X	X		
I. natalis	Yellow bullhead	G	X	X	X	X	X		X
I. punctatus	Channel catfish	G	X	X	X	X	X		X
Noturus gyrinus	Tadpole madtom	NNG	X	X	X	X			
N. nocturnus	Freckled catfish	NNG	X			X			
Pylodictis olivaris	Flathead catfish	G	X	X		X			
Cyprinodontidae	Killifishes								
Adinia xenica		NNG							X
Cyprinodon variegatus	Sheepshead minnow	NNG	X	X		X			
Fundulus chrysotus	Golden topminnow	NNG		X		X			
F. zebrinus	Plains killifish	NNG		X		X			
F. olivaceus	Blackspotted topminnow	NNG							
F. notatus	Blackstripe topminnow	NNG		X	X	X			
F. similis	Longnose killifish	NNG						X	
Lucania parva	Rainwater killifish	NNG		X		X			
Poeciliidae	Livebearers								
Gambusia affinis	Mosquitofish	NNG	X	X	X	X			
Poecilia latipinna	Sailfin molly	NNG						X	X
Atherinidae	Silversides								
Labidesthes sicculus	Brook silverside	NNG		X		X			
Menidia berylliana	Tidewater silverside	NNG		X		X			
M. audens	Mississippi silverside	NNG		X					
Percichthyidae	Temperate Basses								
Morone chrysops	White bass	G		X		X			X
M. saxatilis	Striped bass	G	X	X		X			
Centrarchidae	Sunfishes								
Ambloplites rupestris	Rockbass	G		X		X			
Lepomis auritis	Redbreast sunfish	G	X						
L. cyanellus	Green sunfish	G	X	X	X	X			X
L. gulosus	Warmouth	G	X	X		X			
L. humilis	Orange-spotted sunfish	G	X	X		X			

REVISED TABLE E1-7 (CONTINUED)

Scientific Name	Common Name	Status[1]	Lavaca and Navidad Rivers, Lake Texana[2]	Colorado River	San Bernard River	Brazos River	Oyster Creek[3]	Chocolate, Mustang, and Highland Bayous[4]	Clear Creek
Centrarchidae (Continued)									
L. macrochirus	Bluegill	G	X	X		X			X
L. marginatus	Dollar sunfish	G				X			
L. megalotis	Longear sunfish	G	X	X	X	X			
L. microlophus	Redear sunfish	G	X	X		X			
L. punctatus	Spotted sunfish	G		X		X			
L. symmetricus	Bantam sunfish	G	X	X		X			
Micropterus dolomieui	Smallmouth bass	G		X		X			
M. punctulatus	Spotted bass	G	X		X				
M. salmoides	Largemouth bass	G	X	X	X	X			X
M. treculi	Guadalupe bass	G,C	X	X					
Pomoxis annularis	White crappie	G	X	X	X	X			
P. nigromaculatus	Black crappie	G	X	X					
Percidae	True Perches								
Etheostoma chlorosomum	Bluntnose darter	NNG	X	X	X	X			
E. gracile	Slough darter	NNG	X	X	X	X			
E. grahami	Rio Grande darter	NNG,C,TT		X	X	X			
E. spectabile	Orangethroat darter	NNG		X		X			
Percina caprodes	Logperch	NNG		X		X			
P. macrolepida	Bigscale logperch	NNG		X		X			
P. sciera	Dusky darter	NNG	X	X		X			
Sciaenidae	Drums								
Aplodinotus grunniens	Freshwater drum	G	X	X		X			
Bairdiella chrysura	Silver perch	G						X	
Cynoscion arenarius	Sand seatrout	G						X	
C. nebulosus	Spotted seatrout	G						X	
Micropogonias undulatus	Atlantic croaker	G						X	
Pogonias cromis	Black drum	G						X	
Sciaenops ocellatus	Red drum	G						X	

REVISED TABLE E1-7 (CONTINUED)

Scientific Name	Common Name	Status[1]	Lavaca and Navidad Rivers, Lake Texana[2]	Colorado River	San Bernard River	Brazos River	Oyster Creek[3]	Chocolate, Mustang, and Highland Bayous[4]	Clear Creek
Cichlidae	Cichlids								
Cichlasoma cyanoguttatum	Rio Grande perch	NG	X		X				
Mugilidae	Mullets								
Mugil cephalus	Striped mullet	NNG		X	X	X			X
Bothidae	Lefteye Flounders								
Paralichthys lethostigma	Southern flounder	G							

Sources: Bonn (1980); Bounds (1986); Dolman (1985); Hubbs (1981); Hubbs et al. (1981); Johnson (1977); Konkel and Winger (1974); Menn (1981); Moffett (1975); and Simmons (in press); U.S. Bureau of Reclamation (1974).

[1]Status: G = Gamefish; NG = nongamefish; NNG = native nongame fish; C = federal candidate; TT=Texas threatened (protected nongame).

[2]Fish distribution and occurrence is based on studies in the Lavaca and Navidad River prior to impoundment. It is assumed that fish species in Lake Texana would be similar to these rivers.

[3]Limited fish information is based on fish kill observations. Fish fauna are expected to be similar to San Bernard and Brazos River.

[4]Fish distribution and occurrence is based on studies in Chocolate Bayou. It is assumed that fish species in Mustang and Highland Bayous would be similar.

REVISED TABLE E2-2 OF THE SEIS

THREATENED, ENDANGERED, AND SPECIAL STATUS WILDLIFE SPECIES POTENTIALLY OCCURRING NEAR THE PROPOSED ROUTE

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Proposed Route	Habitat
		Federal Endangered	Federal Threatened							
Southern Bald Eagle	Haliaeetus leucocephalus leucocephalus	FE				SE		Migrant and winter resident throughout Texas. Breeds in coastal prairies, but rare inland.	Conf.[b] in Kimble, Kerr, Gillespie, Blanco, Hays, Bastrop, Colorado, Wharton, Fort Bend, Brazoria, and Harris Counties.[2] Presently nests in Bastrop, Colorado, Fort Bend, and Brazoria Counties. Winter Conc. in Colorado Co.[12]	About 17 nests in the state. Lakes, rivers, and streams all in eastern Texas.[6,10]
Attwater's Greater Prarie Chicken	Tympanuchus cupido	FE				SE		Coastal prairies of SE Texas. Total pop. 1,500.[11,6]	Presently known only from Colorado, Fort Bend and Glaveston Co. Previously conf. in Wharton, Brazoria, and Harris Counties.	Interspersed areas of cropland and tallgrass prairie.[10]
San Marcos Salamander	Eurycea nana		FT				ST	Big Spring Pool at San Marcos, Texas. Hays and Comal Counties.	Conf. in Hays County.[2]	Mats of algae in the Big Spring Pool (source of San Marcos River) and a few hundred feet downstream.[11]
Texas Blind Salamander	Typhlomolge rathbuni	FE				SE		San Marcos, Texas. Hays County.	Conf. in Hays Co.[2]	Caves.
Green Sea Turtle	Chelonia mydas mydas		FT				ST	Coastal, marine. Does not nest in project area.	Prob.[c] in Galveston and Brazoria Counties. Poss. in Harris County.[2]	Open water, beaches. Formerly occurred in Galveston Bay.
Kemp's (Atlantic) Ridley Sea Turtle	Lepidochelys kempi	FE				SE		Coast, marine. Does not nest in project area.	Conf. in Brazoria and Galveston Counties. Poss. in Harris County.[2]	Open water, beaches. Adults do not occur in Galveston Bay.
Loggerhead Sea Turtle	Caretta caretta		FT			SE	ST	Coastal, marine. Does not nest in project area.	Conf. in Brazoria, Galveston, and Harris Counties.[2]	Open water, beaches. Does not occur in Galveston Bay.

REVISED TABLE E2-2 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a] Federal Endangered	Species Evaluated in the BA[a] Federal Threatened	Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Proposed Route	Habitat
Marine Mammals (Whales, Dolphins)[e]				FE,FT	SE	ST		Marine.	Poss. in Brazoria, Galveston, and Harris Counties.	Marine. Whales rarely occur in Galveston Bay. Dolphins occur in Galveston Bay.[e]
Arctic Peregrine Falcon	Falco peregrinus tundrius			FT		ST		Uncommon migrant across the state, mainly coastal in the winter.[6]	Conf. in Crockett, Kerr, Bastrop, Colorado, Wharton, Brazoria, Harris, and Galveston Counties.[2]	Nests on cliffs. Feeds during migration and in winter near rivers, wetlands, coasts, and reservoirs.
American Peregrine Falcon	Falco peregrinus anatum			FE	SE			May nest in Brewster and Culbertson Counties.[6]	Same as above.[f]	Nests on cliffs. Feeds during migration and in winter near rivers, wetlands, coasts, and reservoirs.
Whooping Crane	Grus americana			FE	SE			Migrant in counties north of Aransas NWR where it winters.[6]	Conf. in Colorado, Wharton, and Brazoria Counties.[2]	Marshland, rivers, grainfields, river-bottoms, potholes, prairies.[10]
Jaguarundi	Felis yagouaroundi			FE	SE			Lower Rio Grande Valley near Mexico.	Poss. in Brazoria Co.[2]	Brushy areas and thorn thickets near streams.[9]
Brown Pelican	Pelecanus occidentalis			FE	SE			Coastal, rarely inland. Breeds in Nueces and Brazoria Co.[6]	Conf. in Brazoria and Galveston Co.[2] Expected in Harris and Fort Bend Counties.[10]	Near saltwater habitats.[6]
Eskimo Curlew	Numenius borealis			FE	SE			Coastal migrant in winter; possibly extinct.[6]	Conf. in Galveston County.[2]	Coast of Texas during migration; South America in winter; breeds in tundra.[10]
Piping Plover	Charadrius melodus melodus			FT		ST		Migrant in eastern half of state to coast. Common in winter along coastal prairies.[6]		Not known to nest in Texas. Coastal prairies, coastline, water.

REVISED TABLE E2-2 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Proposed Route	Habitat
		Federal Endangered	Federal Threatened							
Interior Least Tern	Sterna antillarum athalassos			FE		SE		Summers in Panhandle and along Red River (main breeding area) south to McLennan Co. 60 birds nest on Rio Grande River. Could be scattered in other locations. Statewide migrant.	Conf. in Bastrop County.[2]	Individual or in small colonies along reservoirs, rivers, stream sandbars, beaches.
American Alligator	Alligator mississippiensis			T S/A				Eastern one-third of Texas in suitable habitat.	Likely in Bastrop, Fayette, Colorado, Fort Bend, Brazoria, Galveston, and Harris Counties.[11]	Rivers, swamps, estuaries, lakes, marshes.[11]
Houston Toad	Bufo houstonensis			FE		SE		Southeast Texas[1]	Presently known only from Bastrop Co. Previously conf. in Colorado Co. Poss. in Fort Bend and Harris Counties.[2]	Small ponds with sandy bottoms.[1]
Leatherback Sea Turtle	Dermochelys coriacea			FE		SE		Coastal, marine. Does not nest in project area.	Conf. in Brazoria and Galveston Counties.	Open water, beaches. Does not occur in Galveston Bay.
Barton Springs Salamander	Eurycea sp.				FC-2			In Barton Springs near Austin, Texas.	Travis County.	Barton Springs.
Fern Bank Salamander	Eurycea neotenes				FC-2			Austin to Val Verde County, Edwards Plateau.[1]	Conf. in Blanco, Hays, Gillespie, and Kerr Counties.[3]	Small springs, streams, cave waters.[1]
Blanco Blind Salamander	Typhlomogle robusta				FC-2	SE		Hays County, Texas.	Conf. in Hays County.[3]	

REVISED TABLE E2-2 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Proposed Route	Habitat
		Federal Endangered	Federal Threatened							
Alligator Snapping Turtle	Macroclemys temmincki				FC-2		ST	East-central Texas[1]	Possible[1]	Water.
Cagle's Map Turtle	Graptemys caglei				FC-2			South-central Texas; San Antonio and Guadalupe River Systems.[1]	Poss. in Kerr County.	River.
Texas Map Turtle	Graptemys versa				FC-2			Edwards Plateau, Colorado River Drainage.		Water.
Desert Kingsnake	Lampropeltis getulus splendida				FC-3C			West and central Texas.[1]	Conf. in Crockett, Kerr, Hays, Caldwell, Bastrop, Fayette, Colorado, and Wharton Counties.[2]	Thornbush woodlands, deserts, brush, grasslands, chapparral, usually near water.[4]
Gray-banded Kingsnake	Lampropeltis mexicana alterna				FC-3C			Trans Pecos region east to Balconies Escarpment.[1]	Conf. in Upton Co. Poss. in Crockett, Sutton, Kimble, and Kerr Counties.[2]	Acacia-lechugilla-sotol succulent community, limestone floored desert, hillside and canyon embankments, road cuts. 1,200-7,500 feet elevation.[4]
Reddish Egret	Egretta refescens				FC-2		ST	Locally common resident; coastal breeder.[6]	Conf. in Bastrop, Colorado, Brazoria, Galveston, and Harris Counties.[2]	Nests around marshlands in Galveston Bay. Coastal after breeding in shallow, open salt pans.[5]
American Swallow-tailed Kite	Elanoides forficatus forficatus				FC-2		ST	Casual to rare migrant eastern Texas. Does not presently nest in Texas.[6]	Conf. in Kerr, Bastrop, Fayette, Wharton, Fort Bend, Galveston, and Harris Counties.[2]	Tall trees in open woods, wetlands, and bottomlands.[5]
Swainson's Hawk	Buteo swainsoni				FC-2			Statewide migrant, summer in western half of Texas.[6]	Possible[6]	Prairies, rangeland, brush. Has nested near Houston. Rare in winter, possibly occurring near coast.[5]

REVISED TABLE E2-2 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a] Federal Endangered	Species Evaluated in the BA[a] Federal Threatened	Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Proposed Route	Habitat
Ferruginous Hawk	Buteo regalis				FC-2			Statewide migrant, winter, conc. in north Texas and Edwards Plateau.	Possible[6]	Breeds only in Staked Plains. Habitat includes plains and rangeland.[5]
Western Snowy Plover	Charadrius alexandrinus nivosus				FC-2			Uncommon statewide migrant and winter resident, also coastal near Galveston.	Poss. [6]	Breeds locally in Staked Plains. Sand flats, salt flats, sandy beaches of streams, lakes coast. [5]
Mountain Plover	Charadrius montanus				FC-2			Statewide migrant, winters south-central Texas and lower coast.	Possible[6]	Summers in Trans Pecos Texas. Prairies, fields, and plains.
Long-billed Curlew	Numenius americanus				FC-2			Statewide migrant and winter resident.	Possible[6]	Prairies, rangeland, mudflats, beaches. Breeds only in Panhandle and lower coast.[5]
Migrant Loggerhead Shrike	Lanius ludovicianus migrans				FC-2			Migrant in eastern Texas south to coast.[6]	Possible[6]	Open country with scattered shrubs and trees, roadsides, scrub, deserts, etc.[5]
Black-capped Vireo	Vireo atricapillus	Proposed FE					ST	Summers from Edwards Plateau through Mexico.	Nests in Crockett, Blanco, Kimble, Kerr, and Gillespie Co.[7]	Small trees scattered among many bushes (juniper or oak canopy, oak or sumac bushes).[7]
Golden-cheeked Warbler	Dendroica crysoparia				FC-2		ST	Cross timbers south through Edwards Plateau[6]	Conf. in Kimble, Kerr, Gillespie, Blanco and Hays Co.[2]	Older ash juniper, cedars, and oaks. Not normally in riparian or grasslands.[5]
Bachman's Sparrow	Aimophila aestivalis				FC-2		ST	Piney Woods south and west to coast.[6]	Possible[6]	Open pine or oak woods, brushy pastures.[6]
Texas Henslow's Sparrow	Ammodramus henslowii houstonensis				FC-3A				Conf. in Harris County.[6]	In one weedy field southwest of Houston near Deer Park.[6]

REVISED TABLE E2-2 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Proposed Route	Habitat
		Federal Endangered	Federal Threatened							
Southeastern Bat	Myotis austroriparus				FC-2			Eastern Texas.[8]	Poss. in Harris County.[2]	Buildings, caves, trees near water.[8]
Swift Fox	Vulpes velox				FC-2			Texas Panhandle.[8]	Poss. in Upton County.[8]	Short-grass prairie, agriculture.[8]
Black Bear	Ursus americanus americanus				FC-2			Eastern Texas.[8]	Poss. in eastern counties.	Mainly deciduous or coniferous habitats.
Texas Horned Lizard	Phrynosoma cornutum					ST		Most of western Texas, nearly statewide.	Conf. in all counties except Caldwell, Colorado, and Wharton Counties where it is probable.[2]	Flat, open terrain with sparse veg. Sea level to 6,000 feet. Sandy, rocky, or loamy soil.[1]
White-faced Ibis	Plegadis chihi						ST	Common along coast, nests inland to Bexar Co. Migrant throughout state.	Conf. in Bastrap, Colorado, Wharton, Fort Bend, Brazoria, Galveston and Harris Counties.[2]	Freshwater marshes, sometimes brackish.[10]
White-tailed Hawk	Buteo albicaudatus						ST	Uncommon local resident on coastal prairies from Harris Co. south.[6]	Conf. in Colorado, Wharton, Fort Bend, Brazoria, Galveston and Harris Counties.[2]	Open coastal grasslands and semi-arid inland brush.[10]
Zone-tailed Hawk	Buteo albonotatus						ST	Trans Pecos to Edwards Plateau to Bastrop Co.[6]	Conf. in Sutton, Kimble, Kerr, Gillespie, and Hays Counties.[2]	Mesa and mountain country, near water.[10]
Wood Stork	Mycteria americana						ST	Visitor in central and upper coastal prairies.[6]	Conf. in Kerr, Colorado, Wharton, Fort Bend, Brazoria, Galveston, and Harris Counties.[2]	Lakes and reservoirs, wet meadows, swamps, coastal shallows, mud flats.[10]

FOOTNOTES:

[a] BA = Biological Assessment. The first two columns include the speices which the USFWS suggested be included in the BA. The next column includes species ERT felt should also be evaluated, but in less detail because of the lower risk of impact.

[b] Conf. = Confirmed

[c] Prob. = Probable.

[d] Poss. = Possible.

[e] 12 Species confirmed in quadrat 25 (Galveston, Texas). Refer to Table E2-3.

[f] Specific species not recorded during migration.

[g] Federal endangered in breeding range; Federal threatened in migratory and winter range.

[h] Beyond 50 miles of coast, any least tern is endangered.

[i] Threatened by similarity of appearance. Alligators are not threatened in Texas, this classification is a means of harvest control.

[1] Conant 1975. A Field Guide to the Reptiles and Amphibians of Eastern and Central North America.
[2] Texas Parks and Wildlife Department 1986. County Lists of T&E Species Occurrence.
[3] Range map of salamanders from Dr. Jim Dixon, Texas A & M University.
[4] Tennant 1984. The Snakes of Texas.
[5] Peterson 1963. A Field Guide to the Birds of Texas and Adjacent States.
[6] TOS 1984. The TOS checklist of the birds of Texas.
[7] Marshall and Clapp 1985. Status Report - Black-capped vireo.
[8] Davis 1974. The Mammals of Texas.
[9] Burt and Grossenheider 1976. A Field Guide to the Mammals of America North of Mexico.
[10] National Geographic Society 1983. Field Guide to the Birds of North America.
[11] USFWS 1985. Threatened and Endangered Species of Texas and Oklahoma.
[12] Mabie 1986. TPWD (personal communication with Jim Duncan).

REVISED TABLE E2-6 OF THE SEIS

SPECIAL STATUS WILDLIFE SPECIES POTENTIALLY OCCURRING NEAR THE NORTHERN ALTERNATIVE

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Northern Alternative	Habitat
		Federal Endangered	Federal Threatened							
Southern Bald Eagle	Haliaeetus leucocephalus leucocephalus	FE				SE		Migrant and winter resident throughout Texas. Breeds in coastal prairies, but rare inland.	Conf.[b] in Concho, McLennan, Lee, Washington, Austin, Fort Bend, Brazoria, and Harris Counties.[2] Presently nests in Fort Bend and Brazoria Counties.[12]	About 17 nests in the state, all in eastern Texas. Lakes, rivers, and streams.[6,10]
Concho Water Snake	Nerodia harteri paucimaculata		FT			SE		Colorado and Concho Rivers-central Texas, over 199 discontinuous miles.	Conf. in Tom Green, Concho, Coleman, Brown, Mills, and Irion Counties.	Shallow to deep riffles of Colorado and Concho Rivers. Only 22 miles of prime habitat left. Occurs within 200 feet of water.[1,4]
Attwater's Greater Paririe Chicken	Tympanuchus cupida	FE				SE		Coastal prairies of SE Texas. Total pop. 1,500.[11,6]	Presently known only from Austin, Fort Bend, and Galveston Counties. Previously conf. in Brazoria and Harris Counties.[2]	Interspersed areas of cropland and tallgrass prairie.[10]
Green Sea Turtle	Chelonia mydas mydas		FT				ST	Coastal, marine. Does not nest in project area.	Prob.[c] in Brazoria, and Galveston Counties; Poss.[d] in Harris County.[2]	Open water, beaches. Formerly occurred in Galveston Bay.
Kemp's (Atlantic) Ridley Sea Turtle	Lapidochelys kempi	FE				SE		Coast, marine. Does not nest in project area.	Conf. in Brazoria and Galveston Counties. Poss. in Harris Co.	Open water, beaches. Adults do not occur in Galveston Bay.
Loggerhead Sea Turtle	Caretta caretta		FT			SE		Coastal, marine. Does not nest in project area.	Conf. in Brazoria, Galveston, and Harris Counties.[2]	Open water, beaches. Does not occur in Galveston Bay.

REVISED TABLE E2-6 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Northern Alternative	Habitat
		Federal Endangered	Federal Threatened							
Marine Mammals (Whales, Dolphins)[e]				FE,FT		SE	ST	Marine.	Poss. in Brazoria, Galveston, and Harris Counties.	Marine. Whales rarely occur in Galveston Bay. Dolphins occur in Galveston Bay.[e]
Arctic Peregrine Falcon	Falco peregrinus tundrius			FT			ST	Uncommon migrant across the state, mainly coastal in the winter.[6]	Conf. in Tom Green, McLennan, Brazoria, Galveston, and Harris Counties.[2,f]	Nests on cliffs. Feeds during migration and in winter near rivers, wetlands, coasts, and reservoirs.
American Peregrine Falcon	Falco peregrinus anatum			FE		SE		May nest in Brewster and Culbertson Counties.[6]	Same as above.[f]	Nests on cliffs. Feeds during migration and in winter near rivers, wetlands, coasts, and reservoirs.
Whooping Crane	Grus americana			FE		SE		Migrant in counties north of Aransas NWR where it winters.[6]	Conf. in Hamilton, Milam, Coryell, Austin, Bell, Brazoria, and McLennan Counties.[2]	Marshland, rivers, grainfields, river-bottoms, potholes, and prairies.[10]
Jaguarundi	Felis yagouaroundi			FE		SE		Lower Rio Grande Valley near Mexico.	Poss. in Brazoria County.[2]	Brushy areas and thorn thickets near streams.[9]
Brown Pelican	Pelecanus occidentalis			FE		SE		Coastal, rarely inland. Breeds in Nueces and and Brazoria Counties.[6]	Conf. in Brazoria and Galveston Co.[2] Expected in Harris and Fort Bend Counties.[10]	Near saltwater habitats.[6]
Eskimo Curlew	Nemenius borealis			FE		SE		Coastal migrant in winter; possibly extinct.[6]	Conf. in Galveston County.[2]	Coast of Texas during migration; South America in winter; breeds in tundra.[10]
Piping Plover	Charadrius melodus melodus			FT[g]			ST	Migrant in eastern half of state to coast. Common in winter along coastal prairies.[6]	Conf. in Tom Green County.[6]	Not known to nest in Texas. Coastal prairies, coastline, water.

REVISED TABLE E2-6 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Northern Alternative	Habitat
		Federal Endangered	Federal Threatened							
Interior Least Tern	Sterna antillarum athalassos			FE		SE		Summers in Panhandle and along Red River (main breeding area), south to McLennan County. 60 birds nest on Rio Grande River. Could be scattered populations in other locations. Statewide migrant.[h]	Conf. in Tom Green, Coleman, and McLennan Counties.	Individual or in small colonies along reservoirs, rivers, stream sandbars, beaches.
American Alligator	Alligator mississippiensis			T S/A				Eastern one-third of Texas in suitable habitat.	Likely in Burleson, Washington, Austin, Fort Bend, Brazoria, Galveston, and Harris Counties.[11]	Rivers, swamps, estuaries, lakes, marshes.[11]
Houston Toad	Bufo houstonensis			FE		SE		Southeast Texas[1]	Presently known only from Burleson County. Poss. in Austin, Fort Bend, and Harris Counties.[2]	Small ponds with sandy bottoms.[1]
Leatherback Sea Turtle	Dermochelys coriacea			FE		SE		Coastal, marine. Does not nest in project area.	Conf. in Brazoria and Galveston Counties.[2]	Open water, beaches. Does no occur in Galveston Bay.
Fern Bank Salamander	Eurycea neotenes				FC-2			Austin to Val Verde County, Edwards Plateau.[1]	Conf. in Bell County.[3]	Small springs,[1] streams, cave water.
Alligator Snapping Turtle	Macroclemys temmincki				FC-2		ST	East-central Texas.[1]	Possible[1]	Water.
Texas Map Turtle	Graptemys versa				FC-2			Edwards Plateau, Colorado River Drainage.		Water.

REVISED TABLE E2-6 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a] Federal Endangered	Species Evaluated in the BA[a] Federal Threatened	Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Northern Alternative	Habitat
Desert Kingsnake	Lampropeltis getulus splendida				FC-3C			West and central Texas.[1]	Conf. in Irion, Tom Green, McLennan, Falls, Fayette, and Austin Counties.[2]	Thornbush woodlands, deserts, brush, grasslands, chapparral, usually near water.[4]
Gray-banded Kingsnake	Lampropeltis mexicana alterna				FC-3C			Trans Pecos region east to Balcones Escarpment.[1]	Conf. in Upton Co. Poss. in Reagan Co.[2]	Acacia-lechugilla-sotol succulent community, limestone floored desert, hillside and canyon embankments, road cuts. 1,200 to 7,500 feet elevation.[4]
Reddish Egret	Egretta rufescens				FC-2		ST	Locally common resident; coastal breeder.[6]	Conf. in Brazoria, Galveston, and Harris Counties.[2]	Nests around marshlands in Galveston Bay. Coastal after breeding in shallow, open salt pans.[5]
American Swallow-tailed Kite	Elanoides forficatus forficatus				FC-2		ST	Casual to rare migrant in eastern Texas.[6] Does not presently nest in Texas.	Conf. in McLennan, Lee, Fayette, Fort Bend, Galveston, and Harris Counties.[2]	Tall trees in open woods, wetlands, and bottomlands.[5]
Swainson's Hawk	Buteo swainsoni				FC-2			Statewide migrant, summer in western half of Texas.[6]	Possible[6]	Prairies, rangeland, brush. Has nested near Houston. Rare in winter, possibly occurring along coast.[5]
Ferruginous Hawk	Buteo regalis				FC-2			Statewide migrant, winter conc. in north Texas and Edwards Plateau.	Possible[6]	Breeds only in Staked Plains. Habitat includes plains and rangeland.[5]
Western Snowy Plover	Charadrius alexandrinus nivosus				FC-2			Uncommon statewide migrant and winter resident, also coastal near Galveston.	Possible [6]	Breeds locally in Staked Plains. Sand flats, salt flats, sandy beaches of streams, lakes coast. [5]

REVISED TABLE E2-6 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a] Federal Endangered	Species Evaluated in the BA[a] Federal Threatened	Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Northern Alternative	Habitat
Mountain Plover	Charadrius montanus				FC-2			Statewide migrant, winters south-central Texas and lower coast.	Possible[6]	Summers in Trans Pecos Texas. Prairies, fields, and plains.
Long-billed Curlew	Numenius americanus				FC-2			Statewide migrant and winter resident.	Possible[6]	Prairies, rangeland, mudflats, beaches. Breeds only in Panhandle and lower coast.[5]
Migrant Loggerhead Shrike	Lanius ludovicianus migrans				FC-2			Migrant in eastern Texas south to coast.[6]	Possible[6]	Open country with scattered shrubs and trees, roadsides, scrub, deserts, etc.[5]
Black-capped Vireo	Vireo atricapillus	Proposed FE					ST	Summers from Edwards Plateau through Mexico.	Nests in Tom Green, Irion, Crockett, and Bell Counties.[7]	Small trees scattered among many bushes (juniper or oak canopy, oak or sumac bushes).[7]
Golden-cheeked Warbler	Dendroica crysoparia				FC-2		ST	Cross timbers south through Edwards Plateau.[6]	Conf. in Hamilton, Coryell, and Bell Counties.[2]	Older ash juniper, cedars, oaks. Not normally in riparian or grasslands.[5]
Bachman's Sparrow	Aimophila aestivalis				FC-2		ST	Piney Woods south and west to coast.[6]	Possible[6]	Open pine or oak woods, brushy pastures.[6]
Texas Henslow's Sparrow	Ammodramus henslowii houstonensis				FC-3A			Harris County.	Conf. in Harris County.[6]	In one weedy field southwest of Houston near Deer Park.[6]
Southeastern Bat	Myotis austroriparus				FC-2			Eastern Texas.[8]	Poss. in Harris County.[2]	Buildings, caves, trees near water.[8]
Swift Fox	Vulpes velox				FC-2			Texas Panhandle.[8]	Poss. in Upton and Reagan Counties.[8]	Short-grass prairie, agriculture.[8]
Black Bear	Ursus americanus americanus				FC-2			Eastern Texas.[8]	Poss. in eastern counties.	Mainly deciduous or coniferous habitats.
Texas Horned Lizard	Phrynosoma cornutum					ST		Most of western Texas, nearly statewide.	Conf. in all counties except Mills, Hamilton, and Milam Counties were it is probable.	Flat, open terrain with sparse veg. Sea level to 6,000 feet. Sandy, rocky, or loamy soil.[1]

REVISED TABLE E2-6 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Northern Alternative	Habitat
		Federal Endangered	Federal Threatened							
White-faced Ibis	Plegadis chihi						ST	Common along coast, nests inland to Bexar Co. Migrant throughout state.	Conf. in Hamilton, McLennan, Fort Bend, Brazoria, Galveston, and Harris Counties.[2]	Freshwater marshes, sometimes brackish.[10]
White-tailed Hawk	Buteo albicaudatus						ST	Uncommon local resident on coastal prairies from Harris Co. south.[6]	Conf. in Hamilton, McLennan, Fort Bend, Brazoria, Galveston, and Harris Co.[2]	Open coastal grasslands and semi-arid inland brush.[19]
Zone-tailed Hawk	Buteo albonotatus						ST	Trans Pecos to Edwards Plateau to Bastrop Co.[6]	Conf. in Tom Green County.[2]	Mesa and mountain country near water.[10]
Wood Stork	Mycteria americana						ST	Visitor in central and upper coastal prairies.[6]	Conf. in Concho, Mills, Hamilton, McLennan, Lee, Washington, Austin, Fort Bend, Brazoria, Galveston, and Harris Counties.[2]	Lakes and reservoirs, wet meadows, swamps, coastal shallows, mud flats.[10]

[a] BA = Biological Assessment. The first two columns include the species which the USFWS suggested be included in the BA. The next column includes species ERT felt should also be evaluated, but in less detail because of the lower risk of impact.

[b] Conf. = Confirmed

[c] Prob. = Probable.

[d] Poss. = Possible.

[e] 12 Species confirmed in quadrat 25 (Galveston, Texas). Refer to Table E2-3.

[f] Specific species not recorded during migration.

[g] Federal endangered in breeding range; Federal threatened in migratory and winter range.

[h] Beyond 50 miles of coast, any least tern is endangered.

[i] Threatened by similarity of appearance. Alligators are not threatened in Texas, this classification is a means of harvest control.

FOOTNOTES: (Continued)

[1]Conant 1975. A Field Guide to the Reptiles and Amphibians of Eastern and Central North America.
[2]Texas Parks and Wildlife Department 1986. County Lists of T&E Species Occurrence.
[3]Range map of salamanders from Dr. Jim Dixon, Texas A & M University.
[4]Tennant 1984. The Snakes of Texas.
[5]Peterson 1963. A Field Guide to the Birds of Texas and Adjacent States.
[6]TOS 1984. The TOS checklist of the birds of Texas.
[7]Marshall and Clapp 1985. Status Report - Black-capped vireo.
[8]Davis 1974. The Mammals of Texas.
[9]Burt and Grossenheider 1976. A Field Guide to the Mammals of America North of Mexico.
[10]National Geographic Society 1983. Field Guide to the Birds of North America.
[11]USFWS 1985. Threatened and Endangered Species of Texas and Oklahoma.
[12]Mabie 1986. TPWD (personal communication with Jim Duncan).

REVISED TABLE E2-7 OF THE SEIS

SPECIAL STATUS WILDLIFE SPECIES POTENTIALLY OCCURRING NEAR THE SOUTHERN ALTERNATIVE

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Southern Alternative	Habitat
		Federal Endangered	Federal Threatened							
Southern Bald Eagle	Haliaeetus leucocephalus leucocephalus	FE				SE		Migrant and winter resident throughout Texas. Breeds in coastal prairies, but rare inland.	Conf. in Valverde, Kinney, Lavaca, Wharton, Fort Bend, Brazoria, and Harris Counties.[2] Presently nests in Fort Bend and Brazoria Counties.[12]	About 17 nests in the state, all in eastern Texas. Lakes, rivers, and streams.[6,10]
Attwater's Greater Prairie Chicken	Tympanuchus cupida	FE				SE		Coastal prairies of SE Texas. Total population 1,500.[6,11]	Presently known only from Fort Bend and Galveston Counties. Previously conf. in DeWitt, Wharton, Brazoria, and Harris Counties.[2]	Interspersed areas of cropland and tallgrass prairie.[10]
Green Sea Turtle	Chelonia mydas mydas		FT				ST	Coastal, marine. Does not nest in project area.	Prob. in Brazoria, and Galveston Counties; Poss. in Jackson and Harris Counties.[2]	Open water, beaches. Formerly occurred in Galveston Bay.
Kemp's (Atlantic) Ridley Sea Turtle	Lapidochelys kempi	FE				SE		Coast, marine. Does not nest in project area.	Conf. in Brazoria and Galveston Counties. Poss. in Jackson and Harris Counties.[2]	Open water, beaches. Adults do not occur in Galveston Bay.
Loggerhead Sea Turtle	Caretta caretta		FT			SE		Coastal, marine. Does not nest in project area.	Conf. in Brazoria, Galveston, and Harris Counties.[2]	Open water, beaches. Does not occur in Galveston Bay.
Marine Mammals (Whales, Dolphins)[e]				FE,FT		SE	ST	Marine.	Poss. in Brazoria, Galveston, and Harris Counties.	Marine. Whales rarely occur in Galveston Bay. Dolphins occur in Galveston Bay.[e]
Arctic Peregrine Falcon	Falco peregrinus tundrius			FT			ST	Uncommon migrant across the state, mainly coastal in the winter.[6]	Conf. in Crockett, Val Verde, Medina, Atascosa, Bexar, Wharton, Brazoria, Galveston, and Harris Counties.[2,f]	Nests on cliffs. Feeds during migration and in winter near rivers, wetlands, coasts, and reservoirs.

REVISED TABLE E2-7 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Southern Alternative	Habitat
		Federal Endangered	Federal Threatened							
American Peregrine Falcon	Falco peregrinus anatum			FE		SE		May nest in Brewster and Culbertson Counties.[6]	Same as above.[f]	Nests on cliffs. Feeds during migration and in winter near rivers, wetlands, coasts, and reservoirs.
Whooping Crane	Grus americana			FE		SE		Migrant in counties north of Aransas NWR where it winters.[6]	Conf. in Jackson, Brazoria, Kinney, and Wharton Counties.[2]	Marshland, rivers, grainfields, river-bottoms, potholes, prairies.[10]
Jaguarundi	Felis yagouaroundi			FE		SE		Lower Rio Grande Valley near Mexico.	Poss. in Brazoria County.[2]	Brushy areas and thorn thickets near streams.[9]
Brown Pelican	Pelecanus occidentalis			FE		SE		Coastal, rarely inland. Breeds in Nueces and Brazoria Counties.[6]	Conf. in Brazoria and Galveston Counties.[2] Expected in Harris and Fort Bend Counties.[10]	Near saltwater habitats.[6]
Eskimo Curlew	Nemenius borealis			FE		SE		Coastal migrant in winter; possibly extinct.[6]	Conf. in Galveston County.[2]	Coast of Texas during migration; South America in winter; breeds in tundra.[10]
Piping Plover	Charadrius melodus melodus			FT[g]			ST	Migrant in eastern half of state to coast. Common in winter along coastal prairies.[6]		Not known to nest in Texas. Coastal prairies, coastline, water.
Ocelot	Felis pardalis			FE				Lower Rio Grande Valley near Mexico.	Conf. in Val Verde and Atascosa Counties. Prob. in Kinney Co. Poss. in Wilson Co.[2]	Thorny scrub and rocky areas.[9]
Interior Least Tern	Sterna antillarum athalassos			FE		SE		Summers in Panhandle and along Red River (main breeding area), south to McLennan County. 60 birds nests on Rio Grande River. Statewide migrant.	Conf. in Val Verde, and Bexar Counties.[2]	Individual or in small colonies along reservoirs, rivers, stream sandbars, beaches.

REVISED TABLE E2-7 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Southern Alternative	Habitat
		Federal Endangered	Federal Threatened							
American Alligator	Alligator mississippiensis			T S/A				Eastern one-third of Texas in suitable habitat.	Likely in DeWitt, Lavaca, Wharton, Fort Bend, Brazoria, Galveston, and Harris Counties.[11]	Rivers, swamps, estuaries, lakes, marshes.[11]
Houston Toad	Bufo houstonensis			FE		SE		Southeast Texas.[1]	Poss. in Fort Bend and Harris Counties.[2]	Small ponds with sandy bottoms.[1]
Leatherback Sea Turtle	Dermochelys coriacea			FE		SE		Coastal, marine. Does not nest in project area.	Conf. in Brazoria and Galveston Counties.[2]	Open water, beaches. Does not occur in Galveston Bay.
Hawksbill Sea Turtle	Eretmochelys imbricata			FE		SE		Coastal, marine. Does not nest in project area.	Poss. in Jackson Co.[2]	Open water, beaches. Does not occur in Galveston Bay.
Cascade Caverns Salamander	Eurycea latitans				FC-3B		ST	Cascade Caverns, Kendall County (N. edge of Bexar County).	Conf. in Kendall County.[3] Poss. in Medina and Bexar Counties.[2]	Subterranean water systems near Boerne, Kendall County, Texas.[1]
Fern Bank Salamander	Eurycea neotenes				FC-2			Austin to Val Verde County, Edwards Plateau.[1]	Conf. in Bexar, Uvalde, Medina, Kinney, Val Verde, and Edwards Counties.[3]	Small springs, streams, cave waters.[1]
Comal Blind Salamander	Eurycea tridentifera				FC-2		ST	Comal, Bexar, and Medina Counties, Texas. Southeast margin of Edwards Plateau.	Conf. in Bexar Co.; Poss. in Medina Co.[2]	Cave waters. Honey Creek Cave and Cibolo Sinkhole Plain (4 locations), Comal County.[1] Elm Spring Cave, Bexar County.
Valdina Farms Salamander	Eurycea troglodytes				FC-3B			Medina and Bexar Counties, Texas.	Conf. in Medina Co. Poss. in Bexar Co.[2]	Valdina Farms Sinkhole Cave - NW Medina County.[1] Subterranean streams over a wide area of this drainage system.
Black-spotted newt	Notophthalmus meridionalis				FC-2	SE		Southern Texas.[1]	Poss. in DeWitt, Lavaca, and Jackson Counties.[2]	Lagoons, ponds, and swamps in arid areas.[1]

REVISED TABLE E2-7 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Southern Alternative	Habitat
		Federal Endangered	Federal Threatened							
Rio Grande Lesser Siren	Siren intermedia texana				FC-2	SE		Lower Rio Grande Valley, Texas Coast to Aransas and San Patricio Counties.	Poss. in Kinney, Uvalde, Medina, Atascosa, Karnes, and DeWitt Counties.[2]	Rivers slowing into Gulf or Rio Grande River.
Alligator Snapping Turtle	Macroclemys temmincki				FC-2		ST	East-central Texas.[1]	Possible[1]	Water.
Cagle's Map Turtle	Graptemys caglei				FC-2			South-central Texas; San Antonio and Guadalupe River Systems.[1]	Poss. in Karnes, Wilson, Bexar, and DeWitt Counties.	River.
Texas Map Turtle	Graptemys versa				FC-2			Edwards Palteau, Colorado River Drainage.		Water.
Reticulate Collared Lizard	Crotaphytus reticulatus				FC-2		ST	Lower Rio Grande Valley south of Nueces River. South Texas.[1]	Conf. in Uvalde Co.; Poss. in Kinney and Atascosa Counties.[2]	Thornscrub deserts, hilly, rocky well drained gravel, caliche, or sandy soils. Rock outcrops. Prefers prickly pear and mesquite habitats.
Desert Kingsnake	Lampropeltis getulus splendida				FC-3C			West and central Texas.[1]	Conf. in Crockett, Val Verde, Edwards, Medina, Atascosa, Bexar, and Wharton Counties.[2]	Thornbush woodlands, deserts, brush, grasslands, chapparral, usually near water.[4]
Gray-banded Kingsnake	Lampropeltis mexicana alterna				FC-3C			Trans Pecos region east to Blaconies Escarpment.[1]	Conf. in Val Verde and Edwards Co.; Poss. in Crockett and Kinney Counties.[2]	Acacia-lechugilla-sotol succulent community, limestone floored desert, hillside and canyon embankments, road cuts. 1,200-7,500 feet elevation.[4]

REVISED TABLE E2-7 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Southern Alternative	Habitat
		Federal Endangered	Federal Threatened							
Reddish Egret	Egretta rufescens				FC-2		ST	Locally common resident; coastal breeder.[6]	Conf. in Bexar, Jackson, Brazoria, Galveston, and Harris Counties.[2]	Nests around marshlands in Galveston Bay. Coastal after breeding in shallow, open salt pans.[5]
American Swallow-tailed Kite	Elanoides forficatus forficatus				FC-2		ST	Casual to rare migrant in eastern Texas.[6] Does not presently nest in Texas.	Conf. in Bexar, Lavaca, Wilson, Jackson, Wharton, Fort Bend, Galveston, and Harris Counties.[2]	Tall trees in open woods, wetlands, and bottom-lands.[5]
Swainson's Hawk	Buteo sawinsoni				FC-2			Statewide migrant summer in western half of Texas.[6]	Possible[6]	Prairies, rangeland, brush. Has nested near Houson. Rare in winter, possibly occurring along coast.[5]
Ferruginous Hawk	Buteo regalis				FC-2			Statewide migrant winter conc. in north Texas and Edwards Plateau.	Possible[6]	Breeds only in Staked Plains. Habitat includes plains and rangeland.[5]
Western Snowy Plover	Charadrius alexandrinus nivosus				FC-2			Uncommon statewide migrant and winter resident, also coastal near Galveston.	Possible[6]	Breeds locally in Staked Plains. Sand flats, salt flats, sandy beaches of streams, lakes coast.[5]
Mountain Plover	Charadrius montanus				FC-2			Statewide migrant, winters south-central Texas and lower coast.	Possible[6]	Summers in Trans Pecos Texas. Prairies, fields, plains.
Long-billed Curlew	Numenius americanus				FC-2			Statewide migrant and winter resident.	Possible[6]	Prairies, rangeland, mudflats, beaches. Breeds only in Panhandle and lower coast.[5]
Migrant Loggerhead Shrike	Lanius ludovicianus migrans				FC-2			Migrant in eastern Texas south to coast.[6]	Possible[6]	Open country with scattered, shrubs and trees, roadsides, scrub, deserts, etc.[5]

REVISED TABLE E2-7 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a] Federal Endangered	Species Evaluated in the BA[a] Federal Threatened	Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Southern Alternative	Habitat
Black-capped Vireo	Vireo atricapillus	Proposed FE					ST	Summers from Edwards Plateau through Mexico.	Nests in Crockett, Bexar, Uvalde, and Edwards Counties.[7]	Small trees scattered among many bushes (juniper or oak canopy, oak or sumac bushes).[7]
Golden-cheeked Warbler	Dendroica crysoparia				FC-2		ST	Cross timbers south through Edwards Plateau.[6]	Conf. in Edwards, Kinney, Uvalde, Medina, Atascosa, Bexar, and Wilson Counties.[2]	Older ash juniper, cedars, oaks. Not normally in riparian or grasslands.[5]
Bachman's Sparrow	Aimophila aestivalis				FC-2		ST	Piney Woods south and west to coast.[6]	Possible[6]	Open pine or oak woods, brushy pastures.[6]
Texas Henslow's Sparrow	Ammodramus henslowii houstonensis				FC-3A			Harris County.	Conf. in Harris County.[6]	In one weedy field southwest of Houston near Deer Park.[6]
Southeastern Bat	Myotis austroriparus				FC-2			Eastern Texas.[8]	Poss. in Harris County.[2]	Buildings, caves, trees near water.[8]
Swift Fox	Vulpes velox				FC-2			Texas Panhandle.[8]	Poss. in Upton County.[8]	Short-grass prairie, agriculture.[8]
Black Bear	Ursus americanus americanus				FC-2			Eastern Texas.[8]	Poss. in eastern counties.	Mainly deciduous or coniferous habitats.
Texas Tortoise	Gopherus berlandieri						ST	South Texas.[1]	Conf. in Val Verde, Kinney, Uvalde, Medina, Atascosa, Bexar, Wilson, Karnes, and Lavaca Co. Prob. in DeWitt Co. Poss. in Jackson Co.	Shallow pallets at base of bushes or clumps of grass or cactus.[1] Subtropical brush-land and thorn forest.
Texas Horned Lizard	Phrynosoma cornutum						ST	Most of western Texas, nearly statewide.	Conf. in all counties except Karnes, DeWitt, Lavaca, and Wharton Counties were it is probable.	Flat, open terrain with sparse veg. Sea level to 6,000'. Sandy, rocky, loamy soil.[1]

REVISED TABLE E2-7 (CONTINUED)

Common Name	Scientific Name	Species Evaluated in the BA[a]		Other Federal Species Evaluated in the BA[a]	Fed. Candidate Species	State Endangered Species	State Threatened Species	Range in Texas	Southern Alternative	Habitat
		Federal Endangered	Federal Threatened							
Texas Indigo Snake	Drymarchon corais erebennus						ST	South Texas and Rio Grande Valley.[1,4]	Conf. in Val Verde, Edwards, Kinney, Uvalde, Medina, Atascosa, and Bexar Co. Poss. in Wilson and Karnes Counties.[2]	Coastal sandhills to prairie, usually chaparral.[4]
White-faced Ibis	Plegadis chihi						ST	Common along coast, nests inland to Bexar Co. Migrant through state.	Conf. in Uvalde, Bexar, Jackson, Wharton, Fort Bend, Brazoria, Galveston, and Harris Counties.[2]	Freshwater marshes, sometimes brackish.[10]
White-tailed Hawk	Buteo albicaudatus						ST	Uncommon local resident on coastal prairies from Harris Co. south.[6]	Conf. in Medina, Lavaca, Wharton, Brazoria, Galveston, and Harris Counties.[2]	Open coastal grasslands and semi-arid inland brush.[10]
Zone-tailed Hawk	Buteo albonotatus						ST	Trans Pecos to Edwards Plateau to Bastrop Co.[6]	Conf. in Val Verde, Edwards, and Bexar Counties.[2]	Mesa and mountain country near water.[10]
Wood Stork	Mycteria americana						ST	Visitor in central and upper coastal prairies.[6]	Conf. in Val Verde, Uvalde, Medina, Bexar, Jackson, Wharton, Fort Bend, Brazoria, Galveston, and Harris Counties.[2]	Lakes and reservoirs, wet meadows, swamps, coastal shallows, mud flats.[10]
Common Black Hawk	Buteogallus anthracinus						ST	SW Texas, lower Rio Grande Valley. Nests only in Davis Mts. Poss. to Brewster Co.[6]	Conf. in Kinney County.[2]	Along rivers and streams. Rare in SE Texas.[10]

[a] BA = Biological Assessment. The first two columns include the species which the USFWS suggested be included in the BA. The next column includes species ERT felt should also be evaluated, but in less detail because of the lower risk of impact.

[b] Conf. = Confirmed

[c] Prob. = Probable.

FOOTNOTES: (Continued)

[d]Poss. = Possible.

[e]12 Species confirmed in quadrat 25 (Galveston, Texas). Refer to Table E2-3.

[f]Specific species not recorded during migration.

[g]Federal endangered in breeding range; Federal threatened in migratory and winter range.

[h]Beyond 50 miles of coast, any least tern is endangered.

[i]Threatened by similarity of appearance. Alligators are not threatened in Texas, this classification is a means of harvest control.

[1]Conant 1975. A Field Guide to the Reptiles and Amphibians of Eastern and Central North America.
[2]Texas Parks and Wildlife Department 1986. County Lists of T&E Species Occurrence.
[3]Range map of salamanders from Dr. Jim Dixon, Texas A & M University.
[4]Tennant 1984. The Snakes of Texas.
[5]Peterson 1963. A Field Guide to the Birds of Texas and Adjacent States.
[6]TOS 1984. The TOS checklist of the birds of Texas.
[7]Marshall and Clapp 1985. Status Report - Black-capped vireo.
[8]Davis 1974. The Mammals of Texas.
[9]Burt and Grossenheider 1976. A Field Guide to the Mammals of America North of Mexico.
[10]National Geographic Society 1983. Field Guide to the Birds of North America.
[11]USFWS 1985. Threatened and Endangered Species of Texas and Oklahoma.
[12]Mabie 1986. TPWD (personal communication with Jim Duncan).

REVISED TABLE F-1 OF THE SEIS

SUMMARY OF NATIONAL AND TEXAS AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	National Standards[1] Primary[2,3]	National Standards[1] Secondary[2,4]	Texas Standards
Ozone (O_3)	1-hour	235 μg/m^3 (0.12 ppm)	235 μg/m^3 (0.12 ppm)	NS[5]
Carbon Monoxide (CO)	8-hour	10 mg/m^3 (9 ppm)	10 mg/m^3 (9 ppm)	NS
	1-hour	40 mg/m^3 (35 ppm)	40 mg/m^3 (35 ppm)	NS
Nitrogen Dioxide (NO_2)	Annual Average	100 μg/m^3 (0.05 ppm)	100 μg/m^3 (0.05 ppm)	NS
Sulfur Dioxide (SO_2)	Annual Average	80 μg/m^3 (0.03 ppm)	NS	NS
	24-hour	365 μg/m^3 (0.14 ppm)	NS	NS
	3-hour	NS	1,300 μg/m^3 (0.5 ppm)	NS
	30-minute	NS	NS	0.40 ppm[6]
Total Suspended Particulates (TSP)	Annual Geometric Mean	75 μg/m^3	60 μg/m^3	NS
	24-hour	260 μg/m^3	150 μg/m^3	NS
	5-hour	NS	NS	100 μg/m^3
	3-hour	NS	NS	200 μg/m^3
	1-hour	NS	NS	400 μg/m^3
Lead (Pb)	Calendar Quarter	1.5 μg/m^3	1.5 μg/m^3	NS

Source: TACB (1985) (NAAQS)

[1]National standards, other than those based on annual averages or annual geometric means, are not to be exceeded more than once per year.

TABLE F-1 (CONTINUED)

FOOTNOTES (Continued):

[2]Concentration is in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 mm of mercury. All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm Hg (1,013.2 millibars). In this table, ppm refers to ppm by volume, or micromoles of pollutant/mole of gas.

[3]Primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect public health. Each state must attain the primary standards no later than 3 years after the state implementation plan is approved by EPA.

[4]Secondary standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the implementation plan is approved by the EPA.

[5]NS = No Standard

[6]The standard is 0.32 ppm for Jefferson and Orange Counties, and 0.28 ppm for Galveston and Harris Counties. Except in El Paso County, properties are exempt from this standard when a new source is constructed and operated on such properties, providing the construction and operation meet applicable New Source Standards, utilize best available control technology, and do not cause or contribute to a condition such that either the primary or secondary SO_2 NAAQS are exceeded in the area.

REVISED TABLE G-1

PUMP/HEATER STATION NOISE IMPACT MODELING RESULTS

Case		Noise Level at 3-foot Reference Distance (dBA)	Distance from Facility Center to Noise Level Contour (feet)						
			80 dBA	70 dBA	65 dBA	60 dBA	50 dBA	40 dBA	30 dBA
1	Minimum Probable Noise Level[1]	97.8	25	75	135	235	740	2,330	7,365
2	Maximum Probable Noise Level[2]	102.6	40	130	230	405	1,280	4,050	12,800

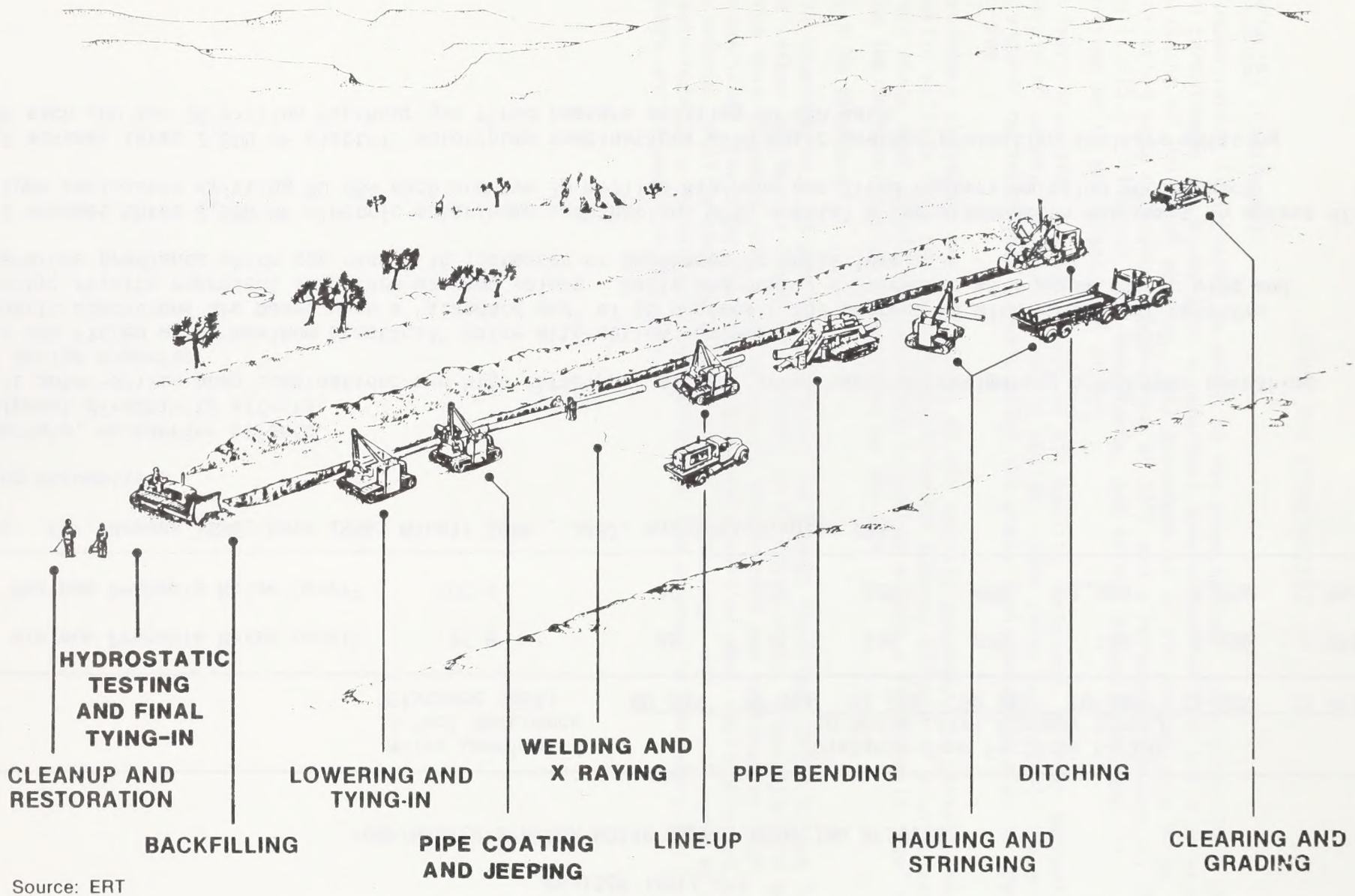
Sources: ERT, Ranada 1986; Rose 1986; Miceli 1986 , 1987; and Christianson 1987.

Modeling Assumptions:

Flat terrain, no barrier effects.
No equipment directivity effects.
Electric motor-driven pump combinations use high efficiency motors; drive speed approximately 1,800 rpm; operating near design capacity.
Heaters are fitted with "maximum practical" noise attenuation equipment.
Atmospheric conditions are based upon a "standard day" of 15 degrees C (59 degrees F) with 70 percent relative humidity; results represent long term average values. Daily and hourly differences will exist due to wind and temperature gradients which can result in increases or decreases in noise levels.

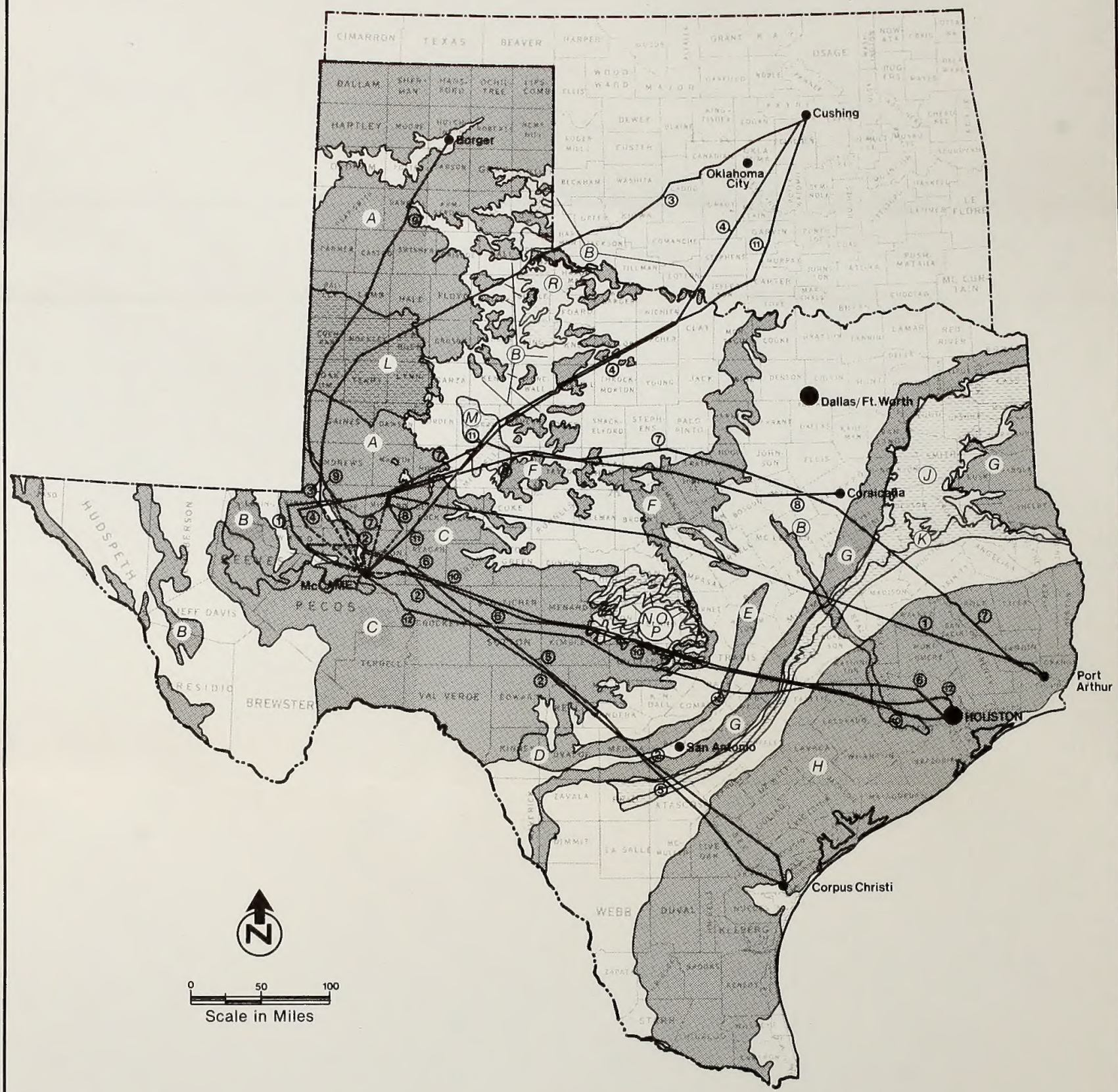
[1]Case 1 assumes three 2,500 HP electric motor/pump combinations with special noise attenuation equipment in excess of WP-2 type enclosures emitting 90 dBA each and two 30 million Btu/hour gas fired heaters emitting 90 dBA each.

[2]Case 2 assumes three 2,500 HP electric motor/pump combinations with basic weather protection shelters emitting 96 dBA each and two 30 million Btu/hour gas fired heaters emitting 90 dBA each.



Source: ERT

FIGURE 2-3. TYPICAL PIPELINE CONSTRUCTION SPREAD



MAJOR AQUIFERS

- *A High Plains (Ogallala)*
- *B Alluvium and Bolson Deposits*
- *C Edwards-Trinity (Plateau)*
- *D Edwards (Balcones Fault Zone—San Antonio Region)*
- *E Edwards (Balcones Fault Zone—Austin Region)*
- *F Trinity Group*
- *G Carrizo-Wilcox*
- *H Gulf Coast*

MINOR AQUIFERS

- *J Queen City*
- *K Sparta*
- *L Edwards-Trinity (High Plains)*
- *M Santa Rosa*
- *N Hickory Sandstone*
- *O Ellenburger-San Saba*
- *P Marble Falls Limestone*
- *R Blaine Gypsum*

PIPELINE SYSTEMS

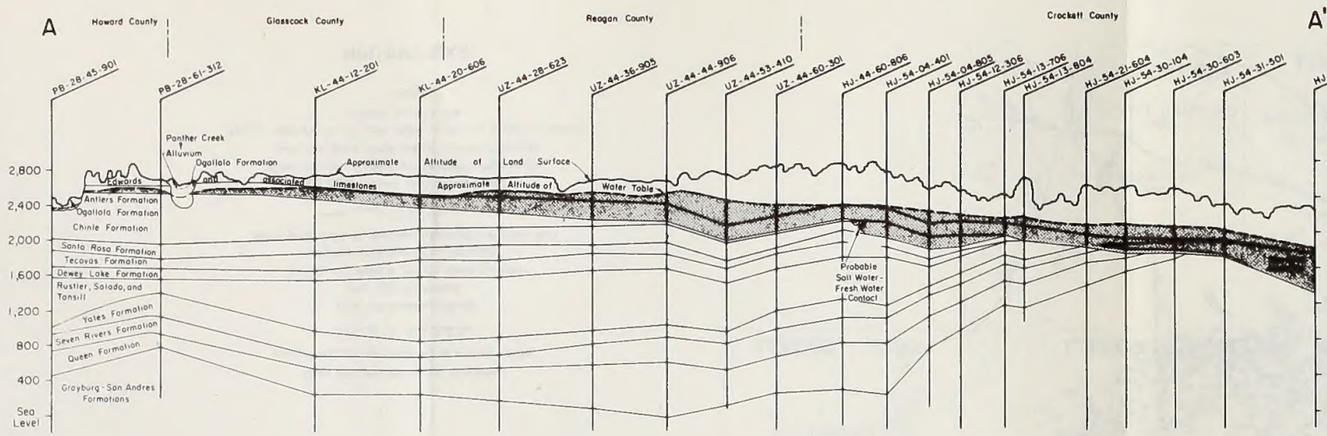
1. **Amdel**
2. **American Petrogina**
3. **Amoco**
4. **Basin**
5. **Exxon (s)**
6. **Exxon (n)**
7. **Mesa/West Texas Gulf**
8. **Mobil**
9. **Phillips**
10. **Rancho**
11. **Shell**
12. **Texas-New Mexico**

Dashed line represents additional pipeline required to reach McCamey.

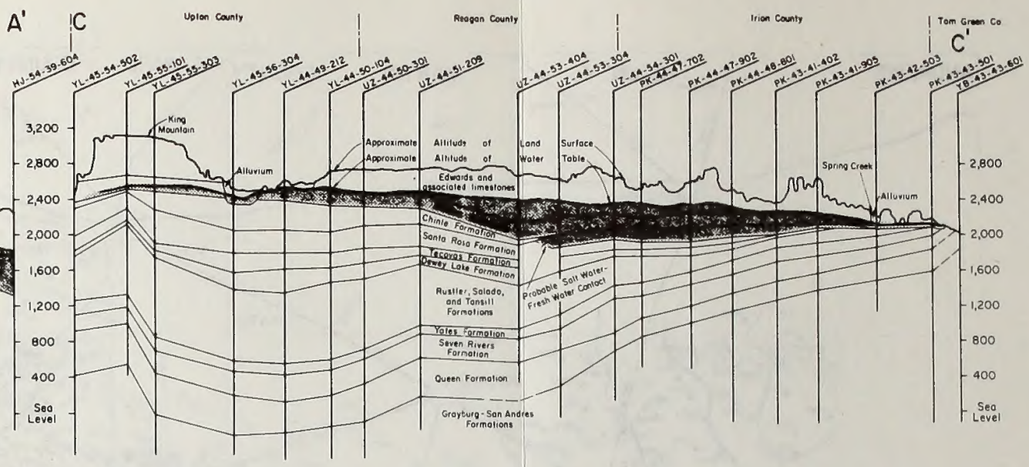
Sources: Modified from Texas Department of Water Resources 1982; Bureau of Economic Geology 1968-1982; and Penwell Map of Crude Oil Pipelines (1984).

Figure 2-7. Existing Crude Oil Pipelines

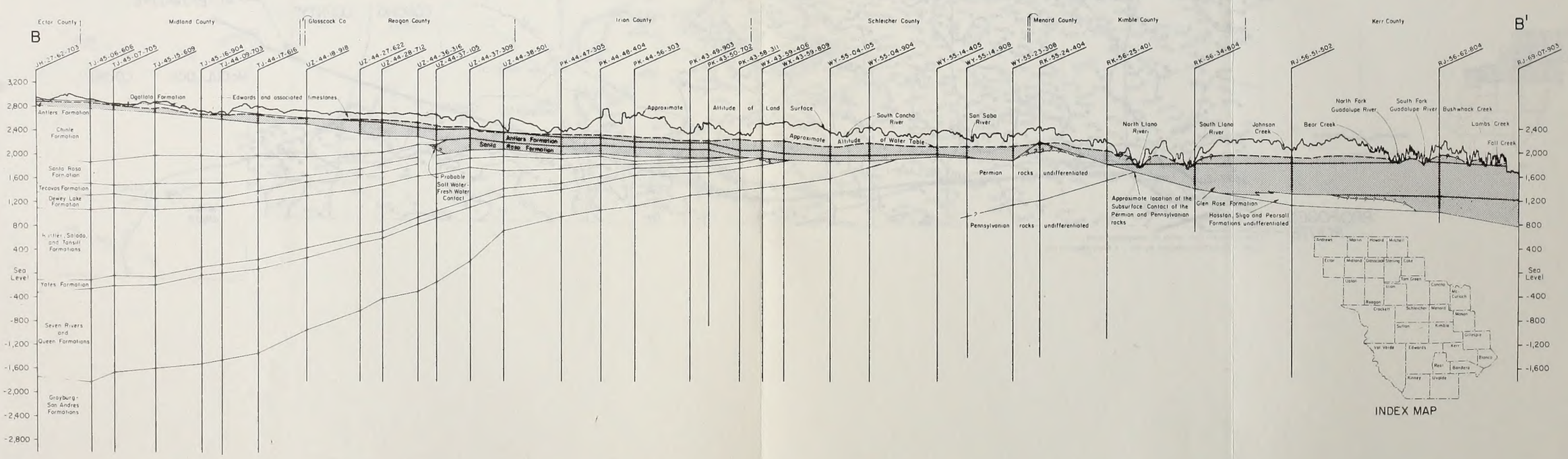
Figure 2-8. Tanker Route from Los Angeles to Texas Gulf Coast



Geologic Section A-A'
Howard County to Crockett County



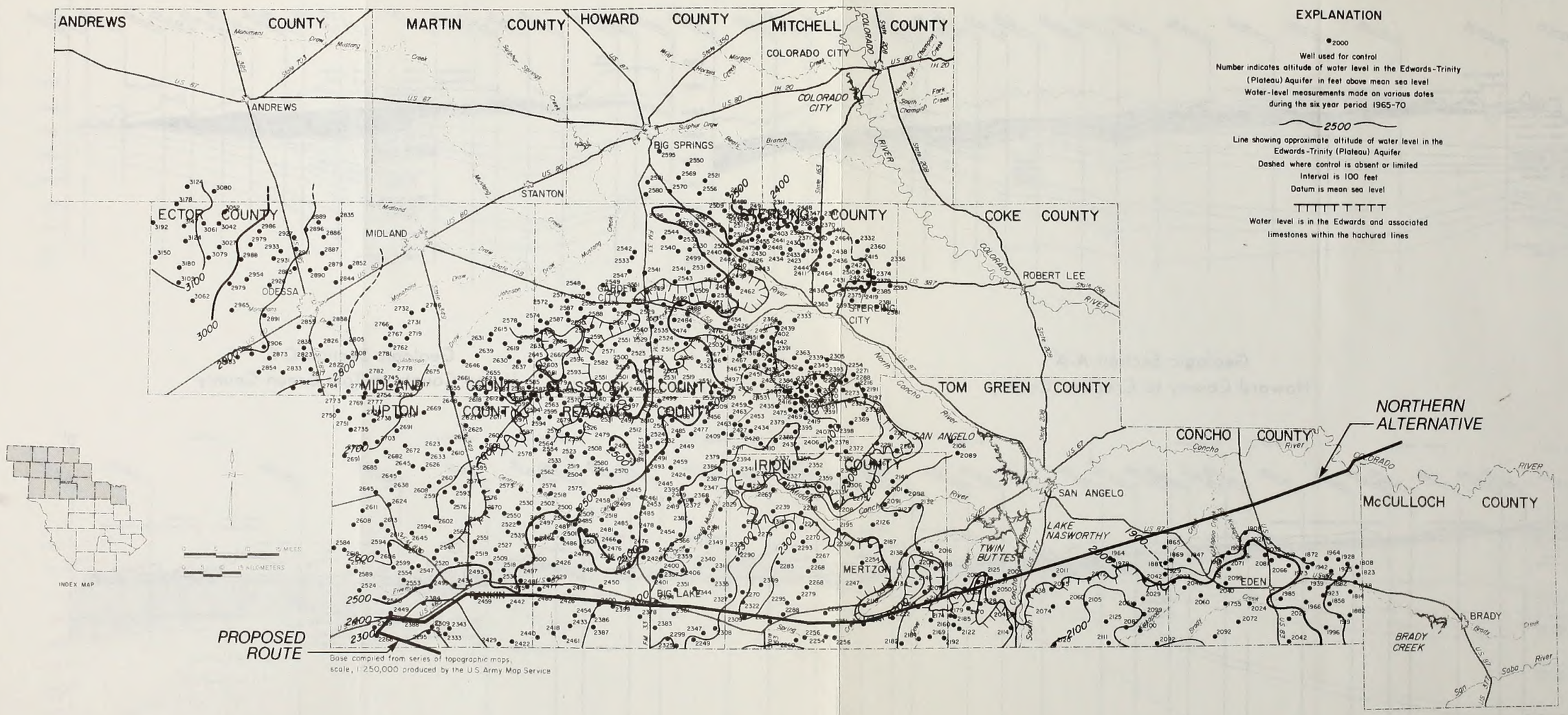
Geologic Section C-C'
Upton County to Tom Green County



Geologic Section B-B'
Ector County to Kerr County

Source: Walker 1979; Figures 10, 11, 12.

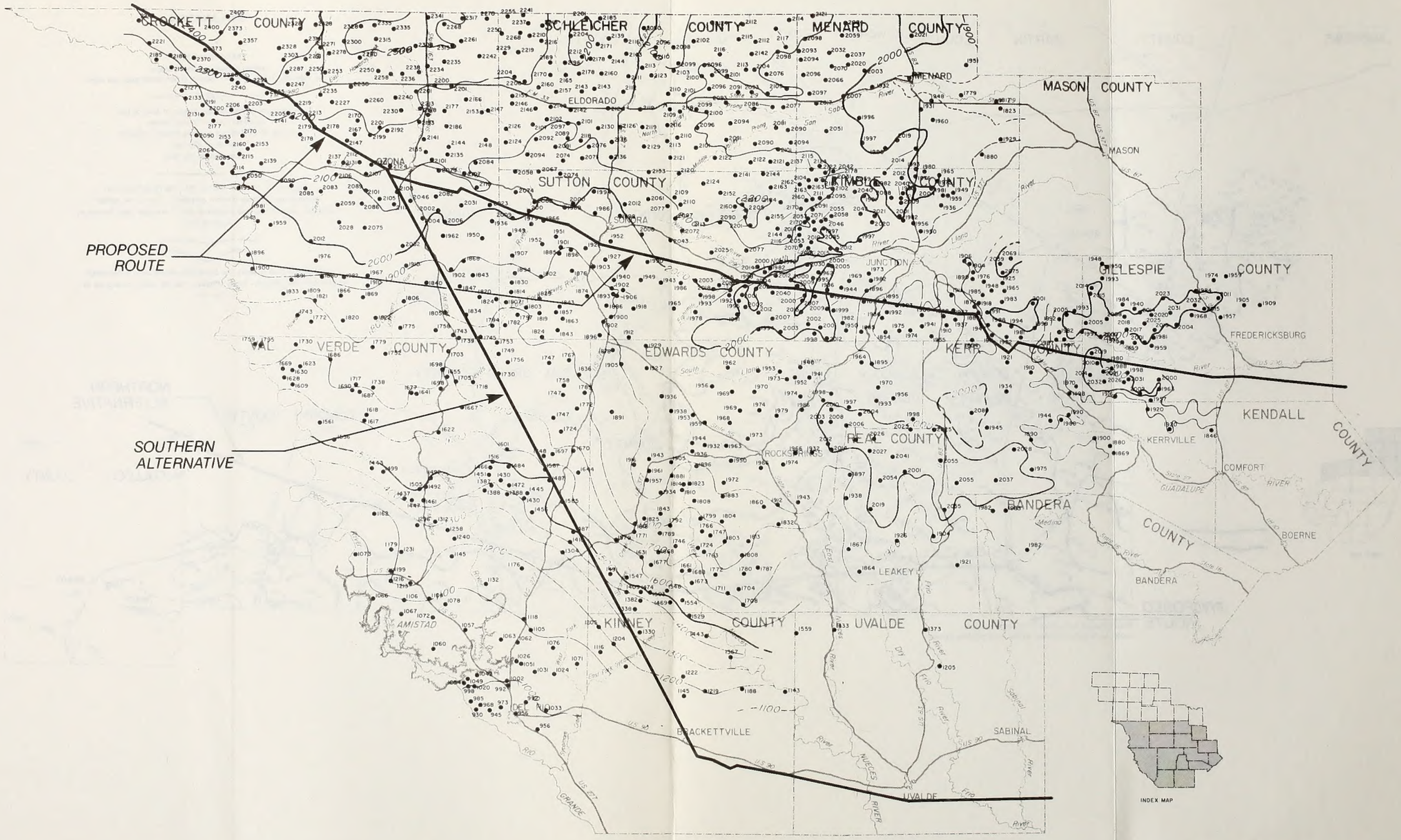
Figure 3-1a. Edwards-Trinity Plateau Aquifer Geologic Sections



Approximate Altitude of Water Levels in the Edwards-Trinity (Plateau) Aquifer

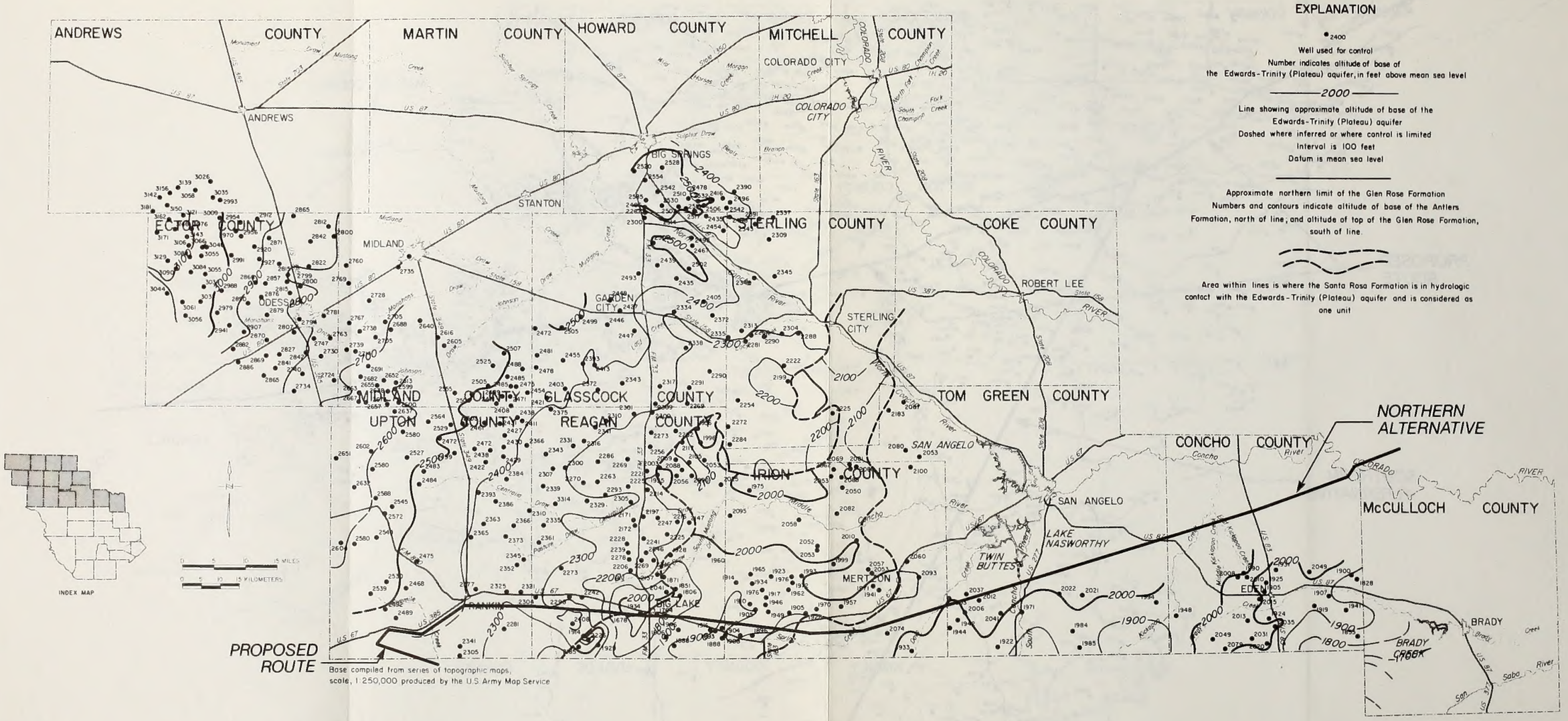
Source: Walker 1979; Figure 15.

Figure 3-1b. Edwards-Trinity Plateau Aquifer Water Levels



Source: Walker 1979; Figure 15.

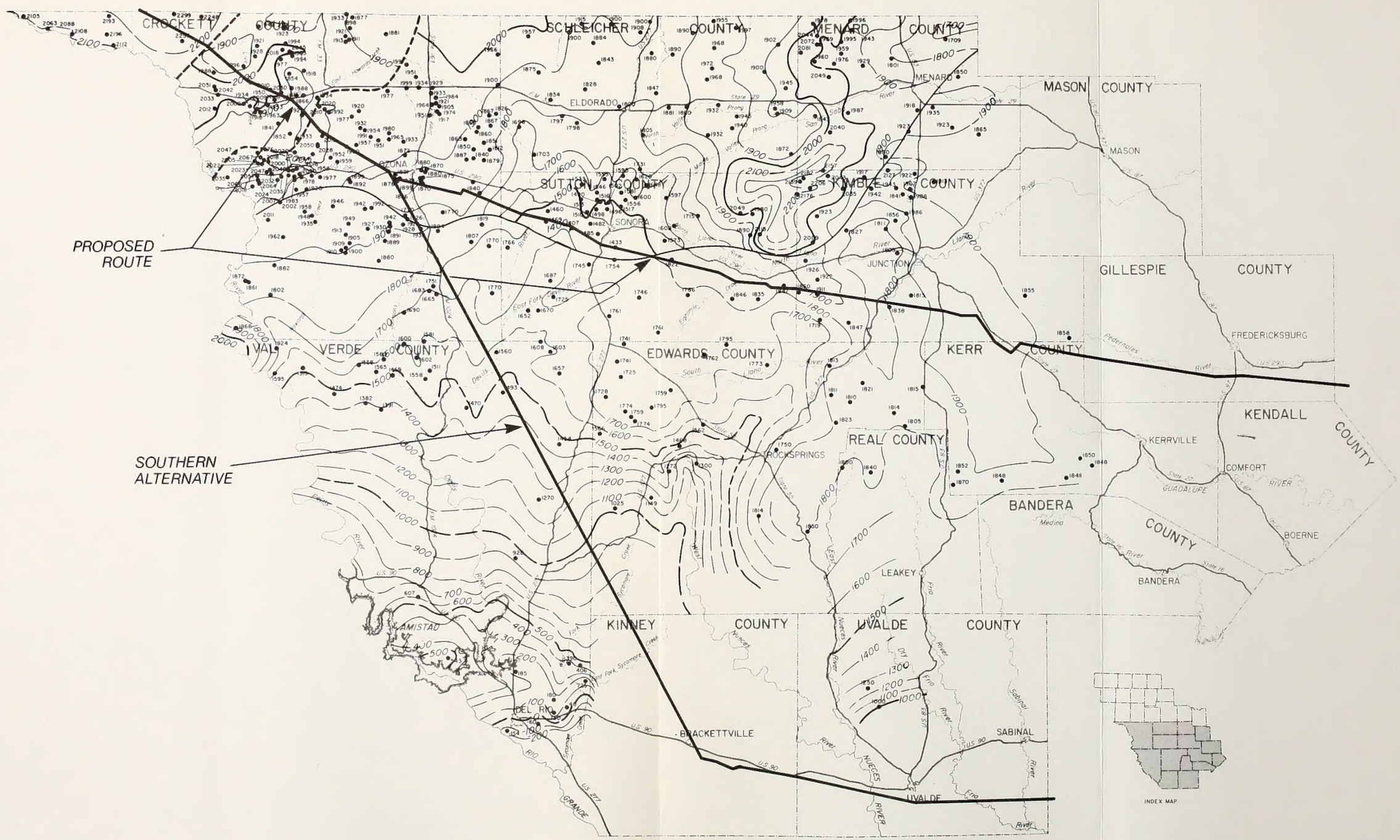
Figure 3-1b. Continued



Approximate Altitude of the Base of the Edwards-Trinity (Plateau) Aquifer

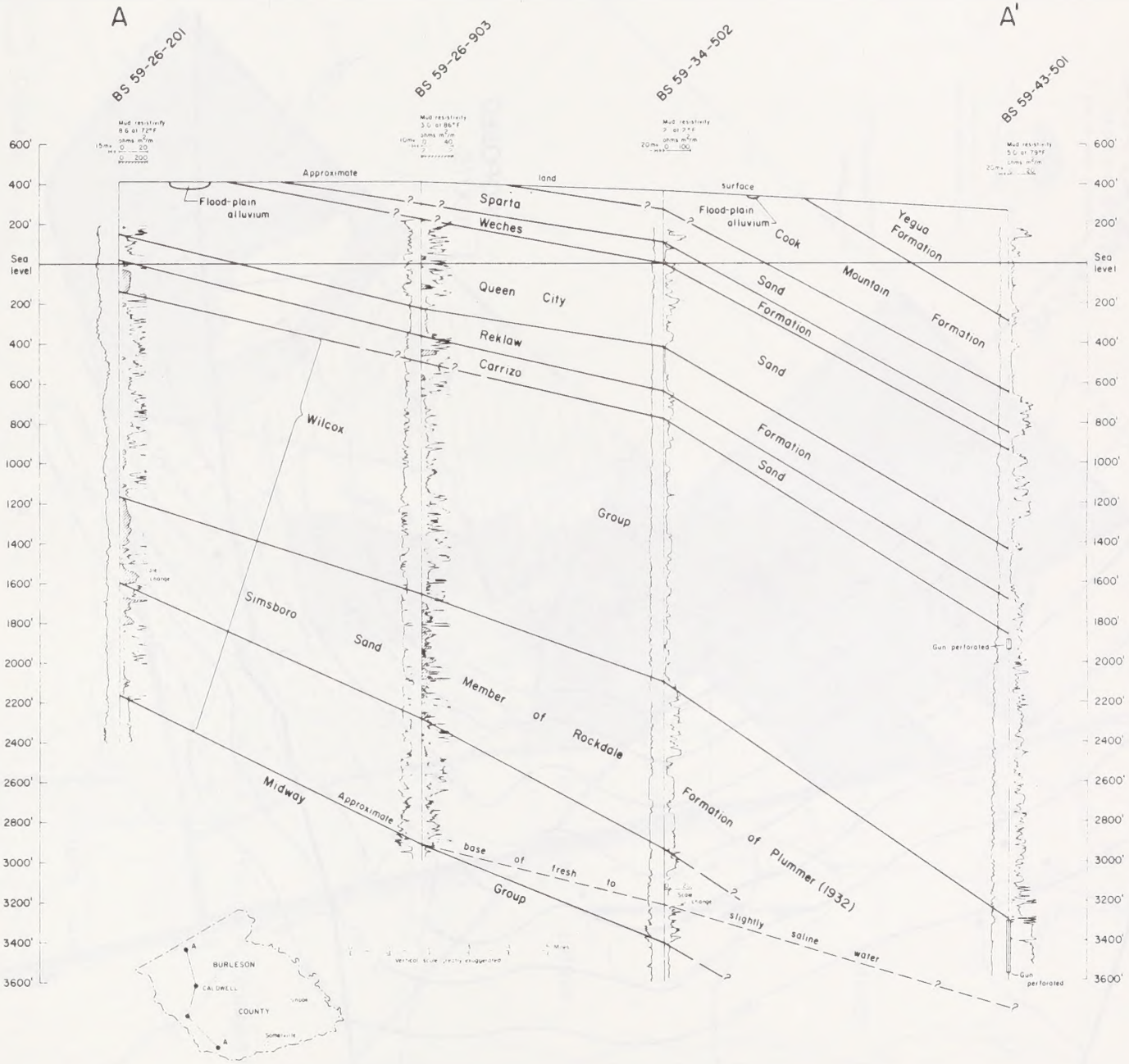
Source: Walker 1979; Figure 13.

Figure 3-1c. Edwards-Trinity Plateau Aquifer Base Altitude



Source: Walker 1979; Figure 13.

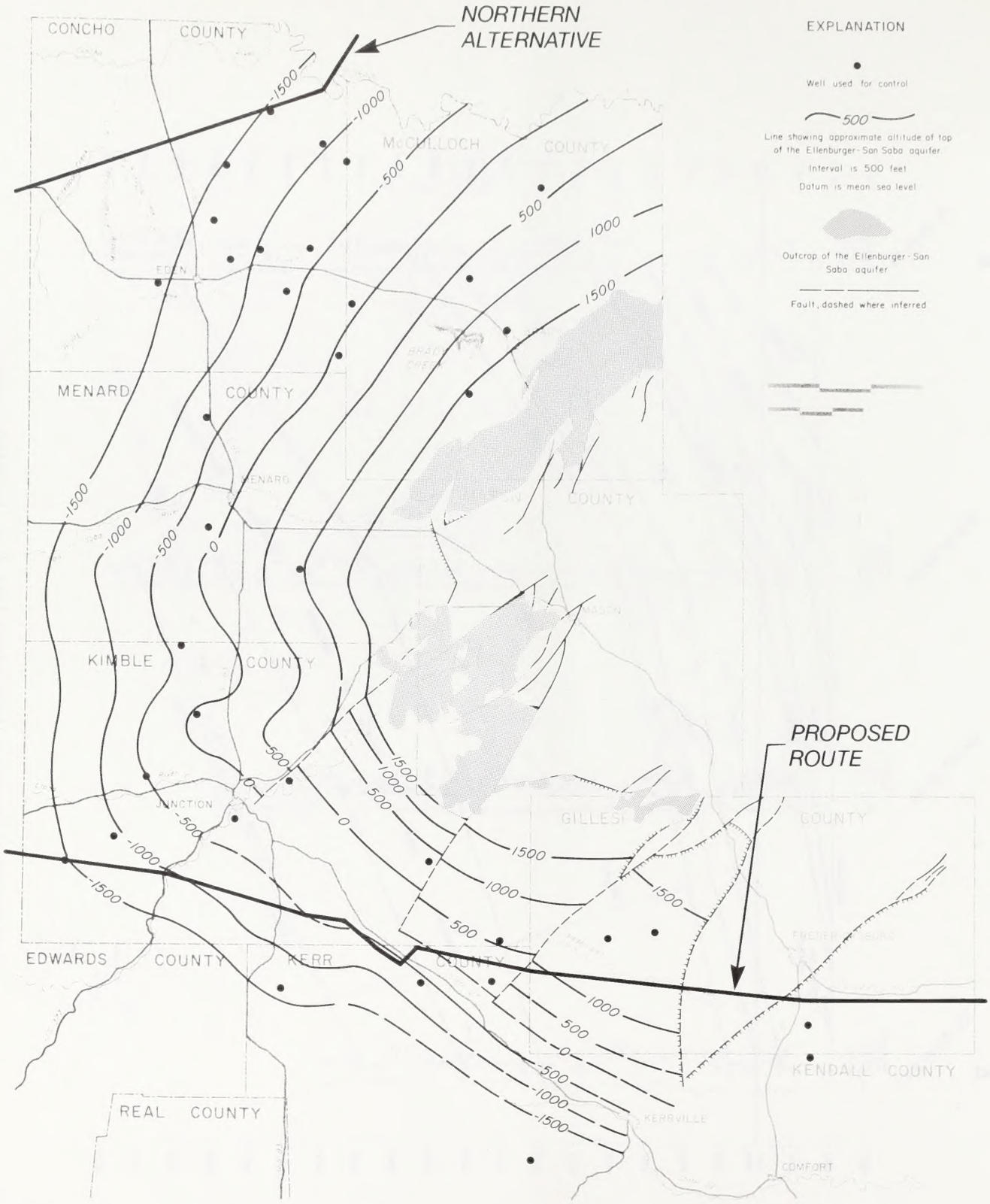
Figure 3-1c. Continued



Correlation of Geologic Units Along Line A-A', Burleson County

Source: Follett, D. R. 1974; Figure 6.

Figure 3-1d. Geologic Section of the Carrizo-Wilcox Aquifer



Base compiled from series of topographic maps, scale 1:250,000. Produced by the U.S. Army Map Service.

Subsurface data primarily from Mount and others, 1967, Plate 12, with some control added. Geology adapted from Darton and others, 1937.

Approximate Altitude of the Top of the Ellenburger-San Saba Aquifer

Figure 3-1e. Altitude of the Top of the Ellenberger-San Saba Aquifer

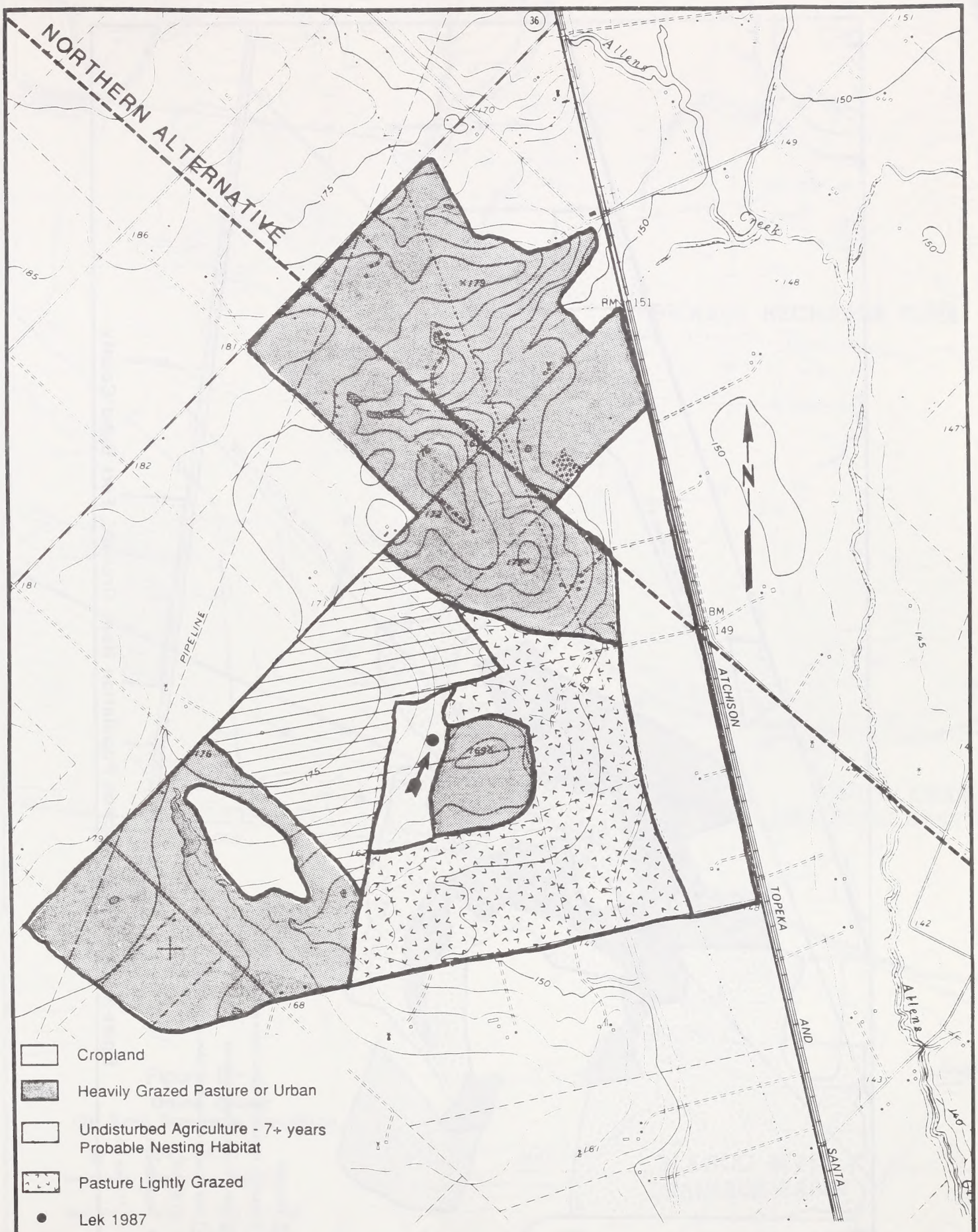


Figure 4-1a. Prairie Chicken Population Near Sealy, Austin County

Figure 4-1b. Prairie Chicken Population Near Orchard, Fort Bend County

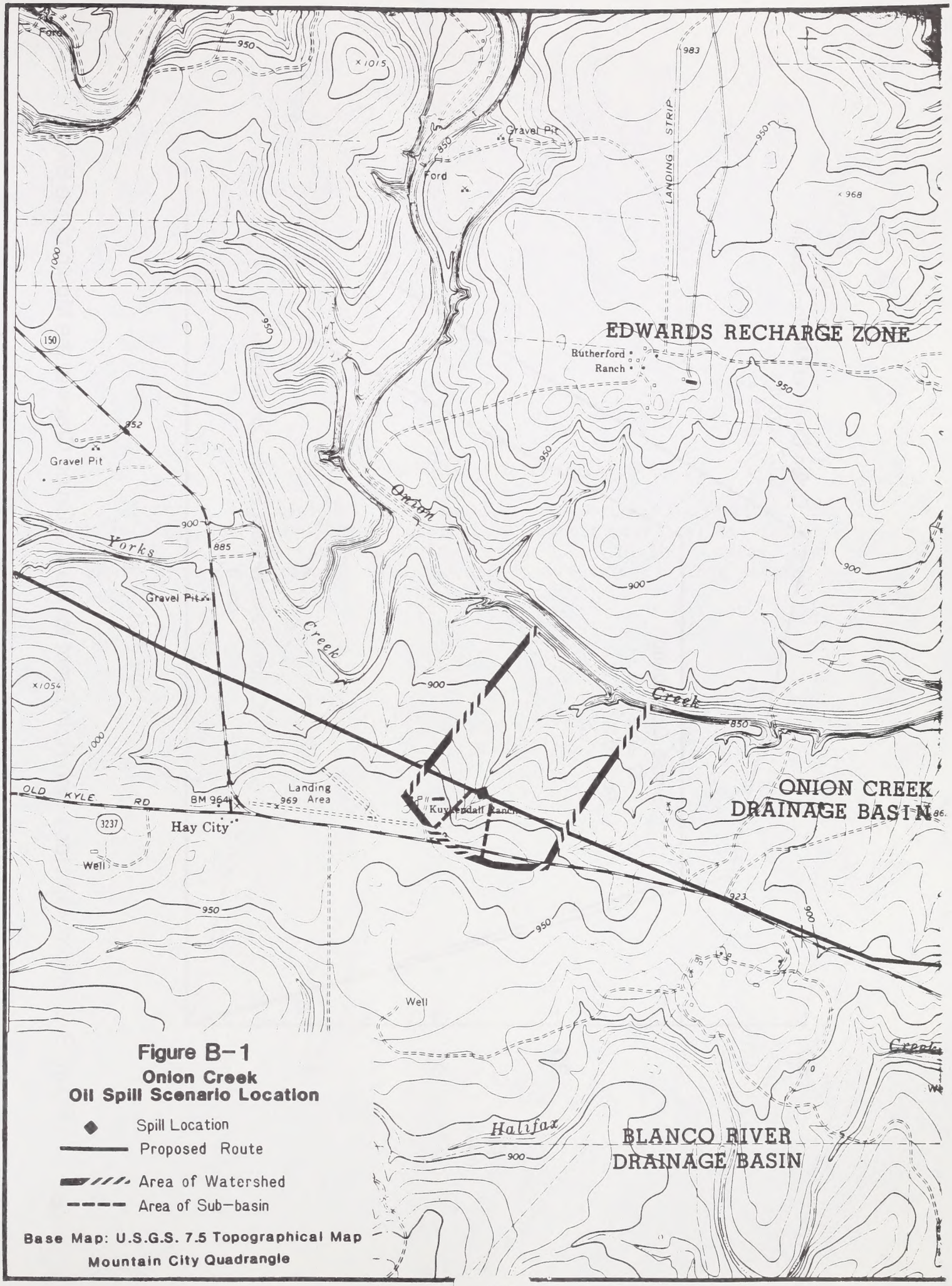


Figure B-1
Onion Creek
Oil Spill Scenario Location

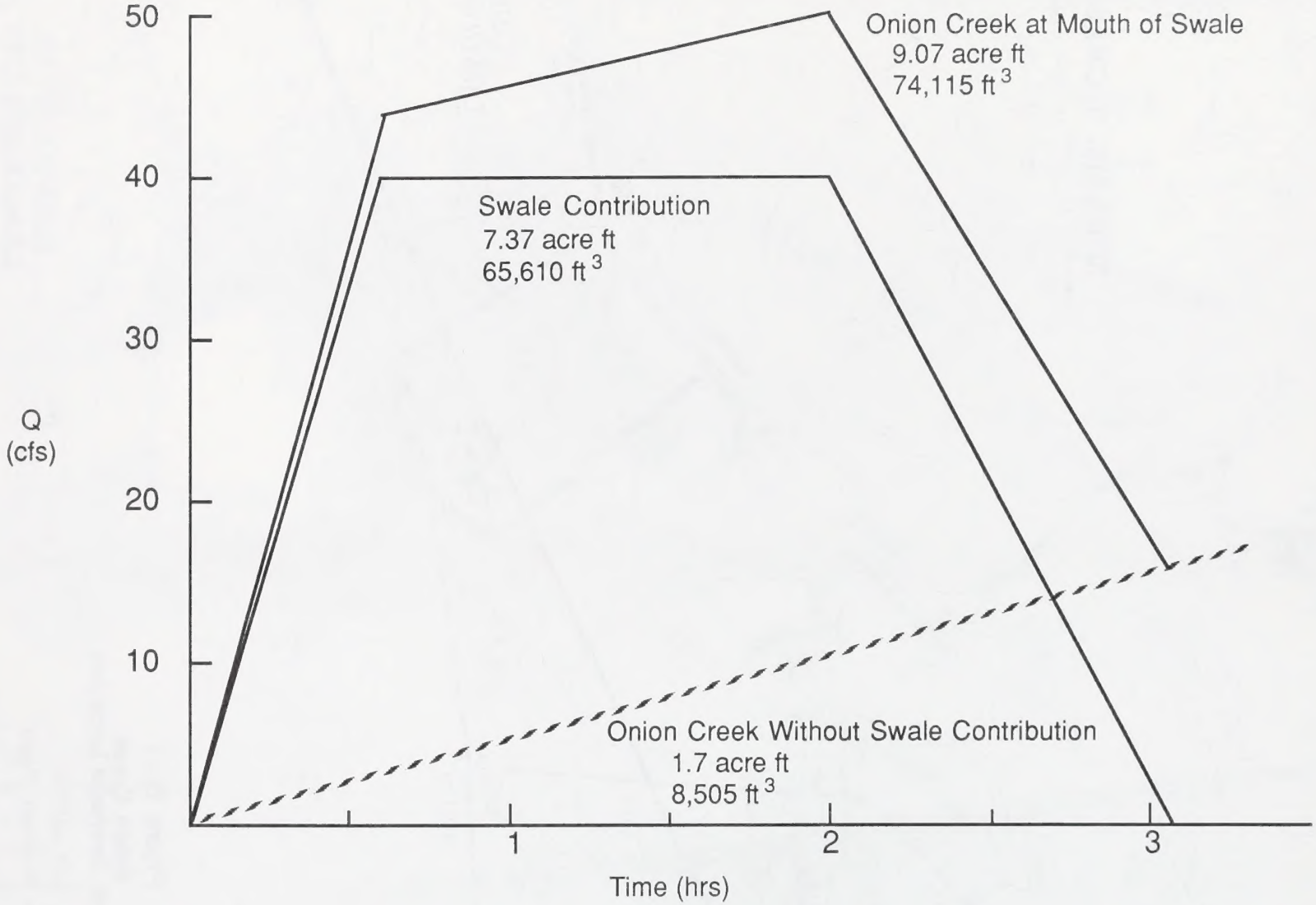


Figure B-2. Hydrograph for 1-inch Rain Event for Flow in Onion Creek at the Mouth of the Swale

3.3 NEW TEXT MATERIAL AND MODIFICATIONS

Section 3.3 presents text sections in which modifications or corrections were extensive enough that is was not practical to present them in the tabular form used in Section 3.1. In these cases, the entire section of text was revised and is presented in this section.

MODIFICATIONS AND CORRECTIONS TO PAGE 2-37

The following section replaces Section 2.3.3 on page 2-37 of the Draft SEIS.

2.3.3 No Project Alternative

The No Project Alternative includes shipment of oil from the Midland/McCamey, Texas area to the Gulf Coast and other refineries in the region through existing common carrier pipelines; shipment by tanker from California; or the use of some other proposed project such as the Pactex Pipeline from California to West Texas and shipment through existing common carrier pipelines to the Gulf Coast. The use of existing common carrier crude oil pipelines from the Midland/McCamey, Texas area to other refineries in the region assumes the existing pipelines are not at capacity and the pipelines could accommodate AAPL crude. See Figure 2-7 for representation of these existing carriers. The estimated capacity of these carriers is listed in Table 2-10a. Total throughput for these carriers is estimated at about 1.5 million to 2 million barrels per day based on the proposed Pactex Pipeline Project EIR/EIS. The actual throughput by these carriers is proprietary. Recent inquiries to the TRRC confirmed no readily accessible public records are maintained on a long-term or short-term basis to show volumes shipped (Sanchez 1987). The largest of these lines includes the Mesa/West Texas Gulf Pipeline and Shell Pipeline Company's Rancho Pipeline. These lines range in age from 25 years for the Rancho line to over 50 years for the Texas/New Mexico line. To ship crude through the existing system, the common carriers must either dilute the heavy crude with their current light crude to allow shipment, or provide heaters to these existing lines to allow shipment for the heavy California crude. Without heating or thinning, the crude cannot be shipped through these systems. Modifications to these pipelines may include installation of insulation and replacement of aged sections to accommodate the optimum pumping capacities of these systems.

The use of tankers would involve the shipping of California heavy crude from ports in California south along the Pacific coast to Panama, across Panama, across the Caribbean and Gulf of Mexico, to the Texas Gulf Coast (see Figure 2-8). This distance is approximately 5,500 miles in length and would most likely utilize tankers in the 50,000 to 100,000 DWT size class. If 100,000 DWT tankers are used, about one ship per day would be required for the 300,000 BPD throughput. Shipment of crude between U.S. ports requires the use of U.S. flag ships.

The use of other alternatives such as the proposed Pactex Pipeline in connection with the existing carriers of West Texas would be similar to the proposed No Action Alternative using the All American Pipeline. The Pactex Pipeline proposes to ship 900,000 BPD of ANS crude to the PADD 3 refineries. Pactex can ship heavy California OCS and San Joaquin Valley crude if it wishes to dilute that crude with the ANS shipment. The Pactex Pipeline has no heating capacity as proposed; its route is from Los Angeles to Midland, Texas. In Midland, it could tie in with the existing common carrier pipeline network as discussed for the first option of the No Project Alternative.

MODIFICATIONS AND CORRECTIONS TO PAGE 2-40

This section replaces Section 2.7 on pages 2-40 through 2-46 of the Draft SEIS.

2.7 BLM Preferred Alternative

2.7.1 Preferred Alternative

Federal agencies are required by the Council on Environmental Quality's NEPA regulations (40 CFR 1502.14) to identify their preferred alternative for a project in the Draft and Final EISs prepared for the project. The preferred alternative for the All American Pipeline Project must be one of the four studied by this SEIS: the Proposed Route, the Northern Alternative, the Southern Alternative, or the No Project (project denial) Alternative. The preferred alternative is not a final agency decision. It is instead an indication of the agency's preliminary preference. The final decision will be announced in a Record of Decision issued at least 30 days after the Final SEIS is published.

The Bureau's preferred alternative is the Northern Alternative. This is the only alternative that the BLM believes is acceptable. The reasons for this choice are summarized below.

2.7.2 Rationale

The impacts of constructing and operating all three routes across Texas would be similar in many respects. The number and likelihood of crude oil spills is approximately the same for the three routes (about eight over the life of the project), and the average spill size would be the same (about 3,750 barrels). There is little difference in the amount of sensitive soils crossed. No route stands out as likely to affect many more or less cultural sites or paleontological localities than any other. Socioeconomic impacts would be minimal. Air quality effects would be essentially the same (since the same amount of crude would be delivered to Gulf Coast refineries in any case, even if delivered by tanker or existing pipeline under the No Project Alternative).

All three routes could significantly affect riparian, wetland, wildlife, freshwater fisheries, and marine resources should a large spill occur along the routes from the Brazos River to Webster and Texas City. The threatened bald eagle habitat could be impacted by an oil spill from any of the three routes.

The effects of the alternatives do differ in several significant ways, however. Significant impacts would occur that would be unique to a given alternative. These differences are addressed by alternative below.

2.7.2.1 Proposed Route. The Proposed Route crosses the Edwards Balcones Fault Zone Aquifer. The probability of a pipeline break is relatively small (there is about one chance in ten that a major spill would occur along the 6-mile stretch over the 40-year project life).

However, should a break occur, crude oil could enter the aquifer in a catastrophic situation (a break near a creek, particularly during a rain). BLM's catastrophic analysis has been reevaluated. As a result, we believe the effects of such a spill could be somewhat more severe than those identified in the Draft SEIS (see Final SEIS Appendix B). All American has already proposed a highly mitigated construction program (seven remote-control valves, trench lining, thick-walled pipe), so most of the reasonable mitigation measures have been included in the project design.

The Proposed Route, like the Northern and Southern Alternatives, could affect several other aquifers. However, it would cross significantly more miles of sensitive aquifers than the Northern Alternative (404 miles rather than 332). All three routes would cross portions of the Edwards Plateau Aquifer, but the Proposed Route would cross a much larger amount. Because both the Edwards Plateau and Edwards Balcones Fault Zone Aquifers are solution limestone formations, an oil spill that reached either aquifer would be difficult if not impossible to clean up. The vulnerability of a sandstone aquifer, such as the Northern Alternative's Carrizo-Wilcox Aquifer is much less, and the feasibility of cleanup is much higher.

2.7.2.2 Northern Alternative. The route's most significant problem involves river crossings. The Colorado River crossing is in the habitat of the threatened Concho water snake. Without mitigation, populations of the snake could be significantly affected. The route crosses several streams at crossing points above municipal water supplies. However, BLM would require valves (many of them remote-control) at each crossing site, which would greatly reduce the potential amount of oil spilled. Further, it would be much easier to clean up spills into rivers than a comparable spill which entered a limestone solution aquifer such as the Edwards.

The route would cross significantly fewer miles of slopes steeper than 15 percent than the Southern Alternative and slightly fewer than the Proposed Route (13 miles as compared to 30 and 17, respectively). The route mileage across sensitive aquifers (332) would be considerably less than for the Proposed (404 miles) and Southern (418 miles) routes. The Edwards Balcones Fault Zone Aquifer would not be crossed. No streams that interact with the Fault Zone Aquifer and that contain sensitive fish populations would be crossed (compared to two by the Proposed Route and six by the Southern Alternative).

2.7.2.3 Southern Alternative. Construction difficulties would present the most serious problems with this route due to the rugged, heavily dissected topography that would be crossed. The route would cross twice as many miles of slopes greater than 15 percent than either of the other 2 routes. Nine unstable slope areas would be crossed (compared to five by the Northern Alternative and one by the Proposed Route). Significantly more miles of slopes steeper than 15 percent would be encountered. These problems could not be mitigated.

Several other significant problems would occur. The route would disturb twice as many acres of riparian vegetation as either the Northern Alternative or the Proposed Route (260 compared to 121 and 138, respectively). Although the Edwards Balcones Fault Zone Aquifer would not be crossed, the route crosses six streams containing important fish populations that interact with the aquifer (compared to two for the Proposed Route and none for the Northern Alternative). An estimated 1,300 residences would be subject to construction noise levels in excess of 65 dBA (compared to 750 for the Northern Alternative and 500 for the Proposed Route). Rivers would be crossed at lower points, closer to coastal estuaries.

2.7.2.4 No Project Alternative. All American may ship its crude through the existing pipeline grid from west Texas to the Gulf Coast. Between 1.5 and 2.0 million barrels per day of pipeline capacity serves west Texas; the actual amount of crude being shipped is not available. There are 12 existing pipelines that could service the All American Pipeline from McCamey and they are all at least 25 years old. Five of these pipelines would cross the Edwards Balcones Fault Zone Aquifer. Since the existing pipelines are older and do not have the same technology as All American, they would have a higher frequency of spills and ruptures. One of the largest of these, Shell Pipeline Company's 24-inch Rancho Pipeline, was cut in May 1986 near Austin, spilling at least 2,400 barrels where it crossed the Edwards Balcones Fault Zone Aquifer. Some lines would have to be retrofitted or rebuilt to ship heavy crude.

If not shipped by pipeline, the crude could be moved by tanker. Tankers would have a greater risk of oil loss, and the resources at risk are generally more extensive and difficult to protect than inland resources. Approximately 3,900 miles along the Pacific Coast and 1,600 miles in the Caribbean and Gulf of Mexico would be vulnerable to tanker spills. During the 40-year project life, tankers would experience about 6 spills greater than 10,000 barrels at 300,000 BPD throughput. This compares to 100,000 barrels lost from an anticipated 27 spills (averaging 3,750 barrels) on the All American Pipeline from California to the Gulf Coast. Oil lost in marine environments is often difficult to contain and clean-up. Emergency response teams generally consider inland spills much easier to deal with; terrestrial spills are normally smaller than tanker spills.

2.7.3 Conclusion

The Northern Alternative presents fewer problems than the other three alternatives. Its difficulties can be corrected to a greater degree. BLM believes it is an acceptable alternative, a conclusion that cannot be reached for the Proposed Route, the Southern Alternative, and the No Project Alternative.

Although the Northern Alternative would create impacts, its effects can in large measure be mitigated. Consider the following: an oil spill along the Proposed Route can still pose a significant risk to the Edwards Balcones Fault Zone Aquifer, despite an intensive mitigation program. The Southern Alternative would encounter severe construction

problems which cannot be mitigated. The No Project Alternative would result in crude being shipped by older pipelines or inherently less safe tankers. The Northern Alternative's problems center on oil spills into rivers; with mitigation, these can be noticeably reduced. These advantages support BLM's conclusion that it is an acceptable alternative, and that it is BLM's preferred alternative.

MODIFICATIONS AND CORRECTIONS TO PAGE 3-8

The following section is an insert to Section 3.2.2.1.1 on page 3-8, following paragraph 1, of the Draft SEIS.

The counties that obtain groundwater from the Edwards-Trinity Plateau Aquifer along the Proposed Route are Upton, Crockett, Sutton, and Kimble. The geologic units that yield useable quantities of groundwater along this part of the Proposed Route consist of Quaternary Alluvium, Edwards and associated limestones, Antlers Formation, Santa Rosa Formation, and the Glen Rose Formation. Figure 3-1a, Sections A-A' and B-B', TDWR (1979), Report No. 235, indicates the stratigraphic relationships between these geologic units in this area. Also from the same report, Figure 3-1b shows the approximate altitude of water levels in the Edwards-Trinity Plateau Aquifer, and Figure 3-1c shows the altitude of the base of the Edwards-Trinity Plateau Aquifer for this area.

The Proposed Route starts at McCamey in Upton County and trends south-southeast into Crockett County. The geologic units that yield useable quantities of groundwater along this part of the route are Quaternary Alluvium, Antlers Formation, Chinle Formation, and the Santa Rosa Sandstone Formation. There are no municipal water supplies that could be affected by the pipeline along this portion of the route as the City of McCamey pipes water from Pecos County 15 miles away.

The Proposed Route crosses the central portion of Crockett County diagonally from the northwest to east-southeast. The municipal water supply that could be affected by the pipeline is that from the City of Ozona which is situated about 4 miles north of the Proposed Route. Data from Figure 3-1b indicate that the general groundwater movement in the county is to the south and south-southeast away from the city water supply. However, data from TWDB (1967) Report No. 47, indicate that heavy pumping by the City of Ozona has caused a groundwater depression in the hydraulic gradient of between 5 to 7 miles in diameter around the city. Therefore, when the city is pumping from the Edwards-Trinity Plateau Aquifer, the general groundwater movement is northward toward the City of Ozona.

The Proposed Route crosses the central part of Sutton County generally trending from west-northwest to east-southeast. The primary geologic unit that yields useable groundwater along this part of the Proposed Route is the Edwards and associated limestones. The only municipal water supply that could be affected by the pipeline is that of the City of Sonora which is 3 miles north of the Proposed Route. Data from Figure 3-1b indicate that the general groundwater movement is to the south, away from the city water supply.

The Proposed Route crosses the southwest corner and southern part of Kimble County trending from west to south-southeast. The primary sources of useable groundwater are from wells and springs in the Edwards and associated limestones. Figure 3-1b shows the approximate altitude of water levels in the Edwards-Trinity Plateau Aquifer. These data indicate that groundwater movement in this area coincides with the

divides of the Llano River basin. Groundwater from the Edwards and associated limestones in bordering counties moves down the hydraulic gradient into Kimble County, where it becomes part of the spring flow or emerges from springs, and then enters Kimble County as the base flow of streams. These sources of water could be affected by the Proposed Route.

MODIFICATIONS AND CORRECTIONS TO PAGE 3-114

The following section is an insert to Section 3.3.2 on page 3-114, following paragraph 5, of the Draft SEIS.

The Edwards-Trinity Plateau Aquifer

The counties that obtain groundwater from the Edwards-Trinity Plateau Aquifer along the Northern Alternative consist of Upton, Reagan, Irion, and Tom Green. The geologic units that produce groundwater along this route consist of Quaternary Alluvium, Edwards and associated limestones, Antlers Sand, Chinle Formation, and the Santa Rosa Formation. Figure 3-1a, Section C-C[1], the geologic section between Upton and Tom Green Counties, TDWR Report No. 235 (1979) indicates the stratigraphic relationships between these geologic units. Also from the same report, Figure 3-1b shows the approximate altitude of water levels in the Edwards-Trinity Plateau Aquifer, and Figure 3-1c shows the altitude of the base of the same aquifer for this area along the Northern Alternative.

The Northern Alternative crosses the southern part of Upton County trending from west to east. The municipal water supply that could be affected by the pipeline belongs to the City of Rankin which obtains water from the Antlers Sand Formation. However, data from Figure 3-1b indicate a general groundwater movement to the south, away from the city water supply.

The Northern Alternative crosses the central part of Reagan County trending from east to west. The municipal water supply that could be affected by the pipeline is that from the City of Big Lake which obtains groundwater from the Edwards and associated limestones and the Antlers Sand Formation. Data from Figure 3-1b indicate a general groundwater movement to the southeast and the city water supply is upgradient from the pipeline.

The pipeline crosses the southern portion of Irion County trending from east to west. The municipal water supply that could be affected by the pipeline is that of the City of Barnhart which obtains groundwater from the Edwards and associated limestones and the Antlers Sand Formation. Data from Figure 3-1b indicate that this area is downgradient from the Northern Alternative.

The pipeline crosses the southern portion of Tom Green County trending from southwest to east-northeast. The municipal water supply that could be affected by the pipeline is that from the Town of Christoval which obtains groundwater from shallow wells and springs of the Edwards and associated limestones. Data from Figure 3-1b indicate that this area is downgradient from the pipeline.

Carrizo - Wilcox Aquifer

The Northern Alternative crosses the Carrizo-Wilcox Aquifer in Milam and Burleson Counties. The Carrizo Sand and the Wilcox Group are in hydraulic continuity and function as a single aquifer. This aquifer is overlain by the Brazos River alluvium along the Northern Alternative.

The thickness of this flood plain alluvium ranges from 9 to 75 ft. About 220 million acre-ft of groundwater is stored in the Carrizo-Wilcox aquifer. The yields of wells in these counties range from a few gallons per minute (gpm) to about 2,500 gpm of fresh to slightly saline water. Figure 3-1d illustrates the approximate thickness of sand containing fresh to slightly saline water in the Carrizo-Wilcox Aquifer and also shows the approximate altitude of the top of the Carrizo Sand in Burleson County. The geologic cross-section shown in Figure 3-1d runs parallel to and in close proximity of the Northern Alternative.

This cross-section illustrates the intermittent flood plain alluvium along this route and also minor, younger aquifers which may be in hydraulic conductivity with the Carrizo-Wilcox Group.

MODIFICATIONS AND CORRECTIONS TO PAGE 4-25

The following Section 4.2.1.4 is an insert on page 4-25 of the Draft SEIS following paragraph 2.

4.2.1.4 EPA Emergency Response. The history of oil spill impacts and emergency response was evaluated by interviewing the EPA Emergency Response Coordinators. EPA was interviewed in Regions VI, VIII, IX, and at the National Center for Emergency Response in New Jersey. These individuals were asked a number of questions with regard to how crude oil spills behaved in freshwater. The general conclusions through all Regions were: 1) oil spills into freshwater systems are of high concern and substantial resources are applied to correct the problem; and 2) no freshwater contamination by crude oil has occurred on a catastrophic scale. Generally speaking, some surface water users could not withdraw water due to safety concerns for one to two days. No long-term contamination by crude oil or its toxic components was found. Standard Oil Spill Contingency Plans were able to cope with containment and cleanup of these spills.

The responses of various EPA Emergency Response Teams are summarized as follows:

1. What amount of a spill is characterized as hazardous? The amount that results in a visible sheen over the surface of the water.

2. How often do you have to respond to a major oil pipeline break? Oil pipeline breaks are very few compared to coastal oil spills and other types of inland oil/product spills (Humphrey 1987).

3. What concentration of oil products in water is required to alert the users of drinking water supplies? In Region 9, a concentration of 10 times the U.S. EPA's drinking water criteria is used to shut down a water supply and to trigger implementation of the use of alternate water supplies. In other Regions (Regions 2, 6, 8, and 10), if a visible sheen is seen near the intake, this is considered a hazardous amount, and alternate drinking water supplies are used (Brubaker 1987).

   To determine if the normal water supply is safe to use, affected municipalities monitor oil and grease concentrations. Other parameters used to determine if a water supply is safe are taste and odor (Metcalf 1987).

4. Who pays for cleanup and alternate water supplies if these are necessary? The responsible party is always liable, although the amount depends upon the party's ability to pay (Anonymous 1987).

5. What kinds of residue analyses are usually conducted? The Emergency Response Teams usually conduct an analysis of the oil in order to fingerprint the oil so it can be traced to the responsible party (Anonymous 1987).

Municipalities and state health departments usually conduct water residue analyses which usually include oil and grease, and to a lesser extent, specific soluble fractions of the oil (Hammack 1987).

6. Have any of the Emergency Response Teams had experience with a pipeline break that contaminated an aquifer? No, none of the Emergency Response Teams in the EPA regions contacted had experience with an aquifer being contaminated by an oil spill (Metcalf 1987).

7. How "clean is clean"? This is determined on a case-by-case basis and depends upon the following:

   1. the resources affected,
   2. the ability of responsible party to pay,
   3. budgets of Emergency Response Team, and
   4. regulation says "reasonably achievable" (Anonymous 1987).

8. How much oil spill activity is there? In Region 8, about 120 to 150 oil and petroleum product spills are reported per year. Of these, the Emergency Response Team responded to about 20 to 30 and of the 20 to 30, only about 10 or 12 actually required cleanup (Jones 1987).

9. What is the overall fate of a crude oil spill in freshwater, especially in a stream? According to Region 8, their broad "rule of thumb" is as follows:

   - <10% is soluble
   - 20% is volatile
   - 10 to 20% is lost onto banks and vegetation
   - 40 to 50% is actually recovered (Jones 1987).

The following is a summary of some case histories of crude oil and/or oil product spills.

1. The San Juan River Spill. This spill occurred in the spring of 1973 as the result of a crude oil pipeline break. The break was caused by record flows and is still the largest inland water oil spill recorded to date for Region 8. The volume of oil spilled was over 10,000 barrels, and it flowed into the San Juan River in Colorado. Because the break occured during high flows, conventional cleanup methods could not be used. Cleanup in this case was assisted by nature in that high flows helped to disperse the oil, and the abundance of debris in the river served to collect it. When the flows subsided, cleanup crews removed the oily debris. U.S. EPA Region 8 had responsibility for emergency response.

   Resources at risk included: 1) The Goosenecks area of the San Juan River, and 2) Lake Powell. No oil was observed to have reached Lake Powell, and fish or wildlife deaths were not observed. No drinking water supplies were at risk (Jones 1987).

2. North Platte River Gasoline Spill. This spill occurred in the North Platte River downstream of Casper, Wyoming in March of 1987 and resulted in an extensive fish kill in a short period of time. No drinking water sources had to be closed. After several miles, most of the gas had volatilized. Because of the volume of water discharged annually by the North Platte River, recovery is expected to be rapid. U.S. EPA Region 8 was responsible for response and cleanup (Jones 1987).

3. Colonial Pipeline Kerosene Spill. The Colonial Pipeline broke twice in 1980 and spilled kerosene into the Rapahannock River and Bull Run Creek in the State of Virginia (U.S. EPA Region 2). A major reservoir on Bull Run Creek that served both recreation and drinking water uses was at risk. Water supply districts were immediately warned. These districts took water samples for oil and grease analysis and they also used taste, odor, and visible sheen criteria to determine effects on water supplies. The Emergency Response Team was the EPAs national team and it collected numerous samples for analyses of benzene, toluene, and other constituents. Fish and wildlife were affected, but hard numbers were not readily available. The area is now fully recovered (Humprey 1987).

4. The San Diego Creek Gasoline Spill. In November 1986, a gasoline pipeline broke and overwhelmed San Diego Creek. Concentrations in the water were as high as 100,000 milligrams/liter. Aquatic life in the Creek was devastated, and at the mouth of San Diego Creek the Newport Ecological Reserve was severely affected.

   After 5 months, concentrations of gasoline in the sediments ranged from 100 to 500 parts per million, with gasoline in the water column much higher. At this point, April of 1987, signs of recovery in the stream of the ecological reserve are scarce (Cartois 1987). This spill occurred in EPA Region 9.

MODIFICATIONS AND CORRECTIONS TO PAGE 4-36

This section is an insert to Section 4.2.3.2 on page 4-36 of the Draft SEIS.

Sediment loading due to construction was analyzed using the Universal Soil Loss Equation (USLE). The basic equation is A = RK(LS)CP where: A = soil loss per unit area, R = rainfall factor or erosion index, K = soil erodibility factor, LS = length slope factor, C = cropping management factor, and P = conservation practice factor.

Sediment loading was calculated using data from the Brazos River crossing near Richmond. This river crossing was chosen because of the amount of data available and because the crossing is representative of stream crossings in the coastal plain for all three routes.

The USLE was used to calculate the amount of sediment entering the Brazos River during construction. The following values were used:

R = 10.1 foot - ton inch/acre hour. This was based on a storm of 2 inches of rain per hour lasting one hour.

K = 0.35 (unitless). Based on a silty sandy soil with slow to moderate permeability.

LS = 3.2. Based on a 200-foot long cut on a 15 percent slope. The 15 percent slope was generated on 30 feet of relief over 200 feet.

C = 0.9. For rough irregular tracks, all directions.

P = 1.0. No conservation practices.

A = 10.2 tons/acre.

Area disturbed on one bank is 200 feet by 100 feet wide; total area equals approximately 0.5 acres. The estimated maximum sediment inflow from the storm is 5.1 tons in approximately one hour.

The table below lists some selected flow values, suspended solids and suspended solids discharged on the Brazos River near Richmond. The table shows that during low flow, the amount of suspended solids discharged is relatively low. However, when discharge is high, the suspended solids discharged are also high. The average annual flow for the Brazos River is about 7,000 cfs, which corresponds to a suspended solids discharge of 4,800 to 6,000 tons per day (200 to 250 tons per hour). An increase of 2 to 2.5 percent in suspended sediment transport caused by construction should not cause a significant impact to occur at average or above-average flows. At very low discharges, sediment transport from overland flow may have a significant effect on total transported material for the river. However, at low flow conditions, we do not expect significant transport of sediment from overland flow because of dry conditions, and during periods of stormy weather sediment transport from overland flow can be controlled by breaks in slope, silt fences, ground cover, etc.

Date	Discharge (cubic feet/second)	Suspended Solids (mg/l)	Suspended Solids Discharged (tons/day)
10/17/81	22,700	6,330	388,000
11/01/81	47,400	4,440	568,000
11/17/81	9,540	91	2,340
03/22/82	1,600	40	173
06/14/82	7,620	384	7,900
11/07/83	2,550	855	5,890
12/21/83	1,060	22	63
06/13/84	2,410	313	2,040
08/29/84	1,030	12	33

The amount of sediment entering the streams in the central and western part of the state is expected to be less. The stream banks in these areas typically have flatter slopes which reduce the transport capability of overland flow, and the thickness of the soil layer is very small because bedrock is often near or at the surface.

MODIFICATIONS AND CORRECTIONS TO PAGE 4-172

This section replaces Section 4.5 of the Draft SEIS, beginning on page 4-172.

4.5 No Project (No Action) Alternative

The No Project (No Action) Alternative would include three methods of crude oil transport should the proposed pipeline not be constructed. The two existing systems include the use of existing pipelines or existing tankers. These two transport systems are complex and are not documented in such a manner to enable a detailed quantitative impact assessment; however, a qualitative analysis has been conducted for this SEIS. As described in Section 2.6, currently operating common carrier pipelines could be used for distribution of crude oil from the Midland/McCamey area to refineries in the Gulf Coast region; the heavy crude oil could be shipped by tanker from California; or the oil could be shipped from California by some other proposed pipeline such as Pactex to West Texas and transferred to currently operating common carrier pipelines for shipment to the Gulf Coast.

4.5.1 Common Carrier Crude Oil Pipelines

The current common carrier crude oil pipelines of West Texas are listed in Table 2-10a. None of these pipelines currently ship crude oil comparable to the heavy OCS or San Joaquin Valley crude oil. To transport oil by these pipelines, the oil would need to be heated or blended with thinner crudes to allow shipment. Because these existing lines are not insulated, it may require more frequent heating or retrofitting of insulation to ensure oil flow of undiluted crude. Many of these lines are small and are at or near capacity. Only the Mesa/West Texas Gulf or Rancho Pipelines are of sufficient size to potentially carry 300,000 barrels of crude per day, but this would result in total displacement of their current contractors. About 15 to 20 percent of the total capacity of all 12 lines would be required to ship the 300,000 BPD of heavy crude. If the heavy crude were blended with the lighter oils, it could possibly be dispersed through the system network. However, from an economic perspective, most carriers are unwilling to blend lower quality crude with higher quality crude and thus reduce its value.

The West Texas Intermediate and Alaska North Slope crudes are worth about $18 to $20 per barrel, and the heavy California crudes are worth about $8 to $10 per barrel. Blending will disproportionately reduce the value of the lighter crudes. If one or two lines were used and their shipments transferred to other lines, which may or may not be possible based on existing standing contracts, retrofits of heaters and possibly insulation would be required. The economics of retrofits are questionable because the economic life of most pipelines is about 40 years before maintenance and repair costs begin to exceed the cost of building a new line. The youngest of these existing lines is the Shell Pipeline Company's Rancho Pipeline which is 25 years old. The oldest of these lines, the Texas/New Mexico, is over 50 years old. Thus, with useful pipeline lives of about 15 years or less, the capital improvements may not be economically viable.

The environmental impacts of using existing pipelines would vary. The pipelines that would require retrofit of heaters and insulation would have construction impacts similar to the proposed All American Pipeline. By evaluating Figure 4-1a and looking at these existing pipeline alignments relative to the Proposed Route, the Northern Alternative, and the Southern Alternative, we can make some general conclusions regarding impacts. The Amdale, the Mesa/West Texas Gulf, and the Mobil pipelines would have impacts similar to the Northern Alternative. The Exxon North line, the Rancho Pipeline, and the Texas/New Mexico line would have impacts similar to the Proposed Route. The American Petrofino line and the Exxon South line roughly parallel the Southern Alternative. Through the combination of all the existing lines, each of the major watersheds within the State of Texas, with the possible exception of the Rio Grande, would be potentially affected by these existing systems. In terms of groundwater, each of the major groundwater basins within the state would be potentially affected (see Figure 2-7). Cumulatively, over 4,000 miles of sensitive aquifers within the State of Texas are crossed by these existing lines. Retrofitting of these lines would, in some respects, be similar to the construction of the All American Pipeline. That is, if one or two of the larger lines, such as the Rancho Pipeline or the Mesa/West Texas Gulf line, were retrofitted with heaters, there would be some construction at the pump stations. Should insulation be required, or some of the lines be replaced, the existing pipeline would be excavated and a new pipeline installed. In summary, the magnitude of construction retrofit impacts would depend on the number of existing lines to be upgraded and the nature of the required retrofits.

The key question relative to impacts of the No Project Alternative versus the Proposed Project rests on the potential operational risks of shipping crude oil by the current common carrier pipeline systems in the West Texas area versus shipment by a new All American Pipeline system. Because these pipelines are all older than 25 years, the risk is greater than that of a new pipeline. The number of spills per mile per year of 50 barrels or more would be at the rate of 1.3×10^{-3} (Mastandrea 1982). For instance, the Rancho Pipeline would have approximately 0.585 spill per year and 23 spills over a 40-year project life, assuming its life could be extended to 65 years. All the systems cumulatively have a spill frequency of approximately 7.2 spills per year. An unknown factor is the increased stress that might be placed on these existing systems by increasing pressure or extending their life to accommodate heavy crude over the proposed 40-year life. As we can see by examining Figure 2-7, the Edwards Aquifer and other sensitive aquifers are at risk at present from these pipelines. Many of the river systems such as the Colorado would still be threatened by potential oil spills. Basic pipeline statistics are based on the number of miles of pipeline. By using an existing system, the total number of miles across sensitive resources would not increase; however, the volume would increase, plus the useful life of these systems would be extended. Table 4-62 in Modifications and Corrections shows how one factor such as remote-control valves can decrease potential oil spill volumes. Many safety

features either are not included in these existing lines, or are not at the same level of effectiveness. If these lines are optimized for full throughput, the likelihood of oil spills and the volume of oil spills would be higher than for the proposed All American project.

In conclusion, it is not clear that it is feasible to retrofit these existing lines to serve the 40-year project life of the All American Pipeline. Secondly, should dilution and blending be required to ship the oil by existing pipelines, it is unlikely the shippers would be receptive to reducing the value of oil shipped. Thirdly, many of the sensitive resources identified for the various alternatives to the All American Pipeline would still be at risk from the same oil, only from existing carriers. Based on extending the useful life of these pipelines 25 or more years and on the cumulative risk from these systems to sensitive receptors in Texas, it appears the No Project Alternative could potentially have greater environmental impacts than the Proposed Route, the Northern or Southern Alternatives and may not be feasible from an engineering, economic, or environmental standpoint.

4.5.2 Tankers

The shipment of oil by tanker would involve loading the heavy crude oil on the West Coast, shipping it to Panama, transfer to the Panama Pipeline, and unloading onto tankers in the Caribbean, or loading the oil onto small ships passing through the Panama Canal for shipment to various Gulf Coast refineries. Approximately 3,900 miles along the Pacific Coast and approximately 1,600 miles in the Caribbean and Gulf of Mexico would be vulnerable to tanker oil spills for a total transport distance of 5,500 miles (see Figure 4-1b). In California, some of the OCS crude could be shipped by pipeline to existing ports, such as Los Angeles and the San Francisco Bay area for loading onto tankers. If the All American Pipeline from Santa Barbara County to McCamey were not operable, some marine tanker terminal expansions may be required in Santa Barbara and San Luis Obispo Counties for shipment of OCS produced in those areas. The tankers would be heated to prevent the oil from solidifying during shipment.

The use of tankers would avoid the potential adverse oil spill impacts to sensitive terrestrial features, such as endangered species, surface water supplies, groundwater supplies, and recreational facilities. However, tankers have a greater risk of oil loss and increased air pollution. Oil spill impacts from tankers are larger in magnitude than pipelines and could potentially damage a large number of sensitive resources including water birds, fin fish, shellfish, wetlands, beaches, marinas, and other marine and estuarine resources. The mean tanker spill volume would be about 19,679 barrels (including spills in port and at sea) (Lanfear and Amstuz 1983). During the 40-year project life, tankers would experience about 6 spills greater than 1,000 barrels at 300,000 BPD throughput (Table 4-61a), and about 9 spills greater than 1,000 barrels at 450,000 BPD (Table 4-61b). Using a 50,000 DWT tanker, about 320,000 barrels per tanker could be transported (ADL 1984); thus, one tanker trip per day would be required for the proposed All American Pipeline throughput.

Comparing the risk of tankers to the proposed All American Pipeline and including the entire distance from Santa Barbara to Texas, approximately 27 spills are estimated for the All American Pipeline during the 40-year project life. At the projected average of 3,750 barrels per spill, the volume of oil spilled during the project life would be about 100,000 barrels. Based on the estimate of about 6 tanker spills greater than 10,000 barrels, with each spill averaging 19,679 barrels, approximately 120,000 barrels would be lost.

Oil lost in marine environments is often difficult to contain and cleanup. The proximity of cleanup equipment, the difficulty of dealing with conditions in open ocean environments, the effectiveness of containment and cleanup equipment, all contribute to a high risk to marine resources. Emergency response teams generally consider inland spills much easier to contain and cleanup; terrestrial spills are normally smaller than tanker spills, especially tanker spills at sea (rather than at port).

4.5.3 Other Alternatives

A third possible No Project Alternative would be to ship oil to Texas through another pipeline such as the proposed Pactex Pipeline. If the Pactex line were constructed as planned, it could deliver 900,000 BPD to Midland, Texas, and use existing common carriers to distribute oil to the Gulf Coast and other regional refineries. The Pactex components indicate they could dilute heavy OCS crude, and San Joaquin Valley crude with ANS to achieve suitable viscosities for an unheated system. Based on our current analysis of the existing common carrier systems, the total capacity is less than 2 million BPD (see Table 3-34). In our judgment, the 900,000 BPD Pactex system would face difficulties similar to the All American Pipeline in terms of distributing its full volume to PADD 3 refineries. There would also be the economic concern of lowering the grade of ANS to dilute the heavy California crudes. The primary goal of the Pactex project is to deliver ANS crude to the PADD 3 refineries; ANS does not require heating, is of a high grade, and has a large refining capacity throughout PADD 3. At this point in time, there appears to be no environmental or economic benefit for the Pactex project over the proposed All American project for transporting heavy California crude through existing common carrier pipelines to the PADD 3 refineries.

MODIFICATIONS AND CORRECTIONS TO APPENDIX A

The following sections (1.1 through 1.5) are inserts to Section 1.0 of the Draft SEIS at the end of page A-1.

1.1 Crude Oil Components

As indicated in Table A1-1, four major sources of crude are expected to be transported by the All American Pipeline, and each of these sources contains a widely varying mixture of crude oil constituents. In order to calculate expected trace constituents and, finally, health effects, assumptions for the percent hydrocarbon breakdown of average West Texas Intermediate crude were made. Please refer to Appendix B of the Final SEIS.

Crude oil typically contains trace amounts of several toxic or hazardous compounds. These trace constituents include volatile organics, polynuclear aromatic hydrocarbons (PAHs), and metals. Table A1-2 includes the solubility limit (in water) and the octanol-water partition coefficient as well as typical concentrations of the major hazardous constituents in crude oil.

The octanol-water partition coefficient is equal to the concentration of a substance in octanol divided by the concentration of the substance in water when the octanol and water solutions are in equilibrium with each other. The high partition coefficients of the volatile organics and especially of the PAHs reflect the hydrophobic nature of these compounds. In the event of a spill of sufficient extent to impact the underlying aquifer, crude oil will pool in a separate phase above the water table. Hazardous constituents will diffuse from this separate crude oil phase into the groundwater. However, concentrations in groundwater will be limited due to the large octanol-water partition coefficients of the organic compounds. For instance, if the crude oil contains 1,000 mg/l benzene, then groundwater in equilibrium with the crude oil will contain approximately 10 mg/l benzene. This relationship is not exact since crude oil is a mixture of several hydrocarbons rather than just octanol, but the nonpolar nature of the hydrocarbons will tend to keep the organic compounds in solution in the crude rather than in the groundwater. The hydrophobic nature of the organic constituents will result in maximum groundwater concentrations significantly below solubility limits. In addition, groundwater velocity can affect maximum concentrations if the velocity is sufficient to make the reaction diffusion-limited within the crude rather than equilibrium limited. Down-gradient of the separate phase crude oil, concentrations will be even lower due to naturally occurring dispersion, degradation, and dilution.

Little information is available on the partitioning of trace metals between crude oil and groundwater. It is commonly assumed that the total quantity of any metal dissolved in the oil will eventually enter the groundwater system. This is a conservative assumption as it neglects differences in water and oil solubilities and assumes that there is a consistent concentration gradient toward the groundwater. A more appropriate conceptual model would be one that accounts for

TABLE A1-1

CRUDE OIL PROPERTIES

	Santa Barbara Channel and Santa Maria Basin (OCS)	San Joaquin Valley (SJV)	Alaskan North Slope (ANS)	West Texas Intermediate (WTI)
Light Gasoline and Naphtha Components (C_5 to 380°)[1] in LV%[3]	10.0	20.5	17.7	33
Heavier Components (380°+)[2] in LV%	89.3	79.5	82.3	66
Sulfur in wgt%[4]	4.36	0.52	1.15	0.82
°API Gravity[5] @ 60°F	17.95 - 19.11	12.6 - 38.6	23.0 - 26.4	27.1 - 53.0
Kinematic Viscosity @ 68°F in centistokes	1,080 - 1,500	5.9 - 4,300	25 - 58	3.1 - 33

[1] C_5 to 300° for OCS.

[2] (300°+) for OCS.

[3] Liquid volume percent.

[4] Weight percent.

[5] Crude oil density.

TABLE A1-2

HAZARDOUS CONSTITUENTS OF CRUDE OIL

Compound	Solubility in Water (mg/l)	K_{ow}	Typical Concentration in Crude Oil (mg/l)
benzene	1,750	100	330-3,400
toluene	535	500	750-20,400
ethylbenzene	152	1,400	660-2,600
xylene (total)	198	890	2,700-27,000
phenanthrene	1.0	29,000	
fluoranthene	0.206	340,000	
pyrene	0.132	200,000	
benzo(a)anthracene	0.0057	400,000	
chrysene	0.0018	400,000	
benzo(b)fluoranthene	0.014	4,000,000	
benzo(k)fluoranthene	0.0043	7,000,000	
benzo(a)pyrene	0.0012	1,000,000	
benzo(g,h,i)perylene	0.0007	10,000,000	
antimony			0.1-0.3
cadmium			1.0-2.5
nickel			3.0-120
copper			0.2-12.0
lead			0.001-0.2
mercury			0.03-0.1

Sources:

W.A. Gruse and D.R. Stevens, "Chemical Technology of Petroleum," McGraw-Hill, New York, 1960.

K. van Nes and H.A. van Western, "Aspects of the Constitution of Mineral Oils," Elsevier, Amsterdam, 1951.

EPA, Superfund Public Health Evaluation Manual, Office of Emergency and Remedial Response, Washington D.C., October 1986.

Note: K_{ow} octanol-water partition coefficient (concentration of chemical in octanol divided by concentration of chemical in water, at equlibrium).

preferential partitioning, background concentrations of metals in groundwater, and equilibrium conditions. The conservative approach overestimates the concentration of metals in the groundwater.

In comparison, the mobility of metals in groundwater has received a great deal of attention. From this work, qualitative judgements of the fate and transport of trace metals in groundwater can be made with a relative degree of confidence.

The Electric Power Research Institute has published a report (EPRI 1982) on the chemical (precipitation/dissolution and adsorption/desorption) and biological (methylation and alkylation) attenuation mechanisms of elements and thus, their hydrogeochemical behavior. In general, the crude oil trace metals have very high potential for retardation. Cations are moderately retarded and anions which are the most mobile constituents have low retardation factors. Of the hazardous trace metals typically found in crude oil (Table A1-2), only antimony is an anion.

The mechanisms responsible for attenuating metals in groundwater are dependent on the groundwater and aquifer characteristics. At the pHs and temperatures typically encountered in groundwater systems the metals in Table A1-2 are generally found in low concentrations in most geologic settings. The degree to which the concentrations of these metals are limited in groundwater is directly dependent on the percentage of clay and organic matter in the aquifer matrix. Clay provides sites for cation exchange and electrostatic adsorption, while organic matter forms complexes with the trace metals. Furthermore, the trace metals in Table A1-2 readily adsorb 10 hydrous manganese and iron oxides. These occur as coatings around sand grains and as discrete grains of oxide mineral and are fairly ubiquitous in soils and sediments. Thus, under typical hydrogeochemical conditions the concentrations of metals are normally held to low levels. Any addition of metals to the groundwater system is usually compensated for by the system's adsorptive capacity. This is generally much greater than the existing concentrations in the groundwater.

Using the values from Table A1-2, two case studies were still investigated. Case 1 surveyed the effects of 1,000 barrels of oil introduced to: 1) a primary limestone aquifer (the Edwards Plateau Aquifer); and 2) a primary sandstone aquifer (the Carrizo-Wilcox Aquifer). Case 2 surveyed the effects of 4,500 bbl of oil introduced to the same two aquifers. In each case study, for the crude oil hazardous constituents benzene, toluene, ethylbenzene and xylene, four calculations were made: 1) the typical concentration (of a particular constituent) in a given volume of crude; 2) the amount of that constituent that would be released by the crude oil based on the octanol-water partition coefficient; 3) the volume of water that could be saturated by the released amount of the constituent; and 4) the volume of water that could be contaminated to significant health risk levels. The potential volume of contaminated water was then compared to the total, available water in each primary aquifer. Refer to Table A1-3 and A1-4 for all calculated values.

TABLE A1-3

CASE 1: 1,000 BBL INTRODUCED TO GROUNDWATER

	Benzene	Toluene	Ethylbenzene	Xylene
Solubility in water-(mg/l)	1750	535	152	198
typical concentration (of particular compound) in 1,000 bbls of crude oil-(mg)	5.248×10^{7} - 5.403×10^{8}	1.192×10^{8}- 3.242×10^{9}	1.05×10^{8}- 4.13×10^{8}	4.29×10^{8}- 4.29×10^{9}
amount of compound that would be released by the crude oil based on the octanol-water partition coefficient-(mg)	5.248×10^{5}- 5.403×10^{6}	2.384×10^{5}- 6.484×10^{6}	7.5×10^{4}- 2.95×10^{5}	4.82×10^{5}- 4.82×10^{6}
volume of water that could be saturated by the released amount of the compound-(l)	300- 3,087	445- 12,119	493- 1,940	2,434- 24,343
volume of water that could be contaminated to significant health risk levels-(l)	8.224×10^{8}- 8.186×10^{9}	7.01×10^{5}[2] 1.91×10^{7}	1.10×10^{5}[3] 4.33×10^{5}	7.77×10^{5}[4] 7.77×10^{6}
potential volume of contaminated water compared to total available water in:				
a. Edwards Plateau Aquifer[5]		1.9×10^{-4} 0.01%	3.0×10^{-5} 1.17×10^{-4}%	2.10×10^{-4} 2.10×10^{-3}%
b. Carrizo-Wilcox Aquifer[6]	.22%-2.21% .25%-2.48%	2.1×10^{-4}- 0.01%	3.3×10^{-5}- 1.3×10^{-4}%	2.4×10^{-4}- 2.4×10^{-3}%

[1]Based on carcinogenic value for benzene of 0.00066 mg/l-from Ambient Water Quality Criteria.

[2]Based on SNARL chronic value for toluene of 0.34 mg/l.

[3]Based on RMCL chronic value for ethylbenene of 0.68.

[4]Based on SNARL chronic value for xylene of 0.62.

[5]This volume is based on water available on a perennial basis and does not include substantial transient storage volume. Estimated total available water = 3.7×10^{11} liters (Klemt et al. 1975).

[6]Estimated total available water = 3.3×10^{11} liters (Follett 1974).

TABLE A1-4

CASE 2: 4,500 BBL INTRODUCED TO GROUNDWATER

	Benzene	Toluene	Ethylbenzene	Xylene
Solubility in water-(mg/l)	1750	535	152	198
typical concentration (of particular compound) in 4,500 bbls of crude oil-(mg)	2.35×10^{8}- 2.43×10^{9}	5.36×10^{8}- 1.46×10^{10}	4.72×10^{8}- 1.86×10^{9}	1.93×10^{9}- 1.93×10^{10}
amount of compound that would be released by the crude oil based on the octanol-water partition coefficient-(mg)	2.35×10^{6}- 2.43×10^{7}	1.07×10^{6}- 2.92×10^{7}	3.37×10^{5}- 1.33×10^{6}	2.17×10^{6}- 2.17×10^{7}
volume of water that could be saturated by the released amount of the compound-(l)	1.34×10^{3}- 1.38×10^{4}	2.0×10^{3}- 5.46×10^{4}	2.22×10^{3}- 8.75×10^{3}	1.10×10^{4}- 1.10×10^{5}
volume of water that could be contaminated to significant health risk levels-(l)	3.56×10^{9}-[1] 3.68×10^{10}	3.15×10^{6}-[2] 3.58×10^{7}	4.95×10^{5}-[3] 1.96×10^{6}	2.17×10^{6}-[4] 2.17×10^{7}
potential volume of contaminated water compared to total available water in:				
a. Edwards Plateau Aquifer[5]	.96- 9.95%	3.5×10^{-4}- 0.02%	1.34×10^{-4} 5.3×10^{-4}%	5.9×10^{-4}- 0.01%
b. Carrizo-Wilcox Aquifer[6]	1.1- 11.2%	9.5×10^{-4}- 0.03%	1.5×10^{-4}- 6.0×10^{-4}%	6.6×10^{-4}- 0.01%

[1]Based on carcinogenic value for benzene of 0.00066 mg/l-from Ambient Water Quality Criteria.

[2]Based on SNARL chronic value for toluene of 0.34 mg/l.

[3]Based on RMCL chronic value for ethylbenzene of 0.68.

[4]Based on SNARL chronic value for xylene of 0.62.

[5]This volume is based on water available on a perennial basis and does not included substantial transient storage volume. Estimated total available water = 3.7×10^{11} liters (Klemt et al. 1975).

[6]Estimated total available water = 3.3×10^{11} liters (Follett 1974).

The same calculations were then applied to the total soluble crude. For each case study, the concentration of total soluble crude was calculated using: 1) an assumed value of total crude available for dissolution (see Appendix B of the Final SEIS for reference to this assumption) of 41.85 percent; and 2) a historical value of total crude available for dissolution of 10 percent which has been found in aquifers after oil spills (EPA Region VIII Emergency Response Branch). Refer to Table A1-5 for all calculated values.

1.2 Behavior of Crude Oil in Porous Media

The following discussion on migration of crude oil through porous media is quoted directly from descriptions by Blake and Lewis 1983, and Freeze and Cherry 1979.

Once hydrocarbons are lost through leaks or spills to the ground, their behavior and ultimate fate become dependent on the local hydrogeologic conditions. Petroleum products tend to follow the most permeable zones, such as artificial fills, pipeline trenches, foundation fills, etc. These backfilled excavations are commonly filled with more permeable material than the native soils, thus they offer a low-resistance migration route. A spill which might otherwise have contaminated a relatively localized area can spread laterally through these zones of artificially high permeability and make identification of the source difficult.

In general, the spilled product will migrate downward through the unsaturated zone with some lateral spreading. The rate of this downward migration will be dependent on the physical properties of the soil, the type of product, and the volume of product spilled. The greater the permeability and volume of the spill and the lower the viscosity of the product, the more rapid the migration of the spill. The downward migration of the product will eventually be stopped either by retention in the soils, an impermeable barrier, or the water table.

If the migrating product encounters a large enough volume of soil, all of the product may become pellicular and effectively immobilized before it reaches the water table. The immediate hazard of groundwater contamination in this instance is reduced; however, subsequent recharge from precipitation will transport mobile components of the hydrocarbon to the aquifer. The volume of product retained by the soil will be dependent upon the soil characteristics (i.e., porosity and pore size distribution) and the type of petroleum.

If the hydrocarbon encounters an impermeable barrier, it may spread along this layer and gradually be retained by the soil until it reaches an immobile state. However, if the leak continues or if the volume of product is large enough, it will accumulate on this layer and flow down dip until it reaches an outcrop and forms a surface seep or encounters the water table. Blake and Lewis 1983.

Figure A1-1 depicts the manner in which crude migrates through a porous media to the water table. In the first migration stage, the oil movement is primarily downward under the influence of gravitational

TABLE A1-5

TOTAL SOLUBLE CRUDE

	Case 1: 1,000 bbl		Case 2: 4,500 bbl	
Solubility in water (mg/l)	50	50	50	50
concentration of total soluble (%)	41.85%[2]	10%[1]	41.87%[2]	10%[1]
Amount of compound[3] that would be released by the crude oil (mg)	5.49×10^{10}	1.32×10^{10}	2.48×10^{11}	5.94×10^{10}
volume of water that would be saturated by the released % total soluble (l)	1.10×10^{9}	2.64×10^{8}	4.97×10^{9}	1.18×10^{9}
volume of water that could be contaminated to significant health risk levels (l)	1.10×10^{11}- 5.49×10^{11}	2.64×10^{10} 1.32×10^{11}	4.96×10^{11} 2.48×10^{12}	1.19×10^{11} 5.94×10^{11}
potential volume of contaminated water compared to total available water in:				
a. Edwards Plateau Aquifer	29-148%	7%-36%	134-670%	32-161%
b. Carrizo-Wilcox Aquifer	33-166%	8%-40%	150-751%	36-180%

[1]Amount of soluble crude which has historically been found in aquifers after spills.

[2]Assumed total crude available for dissolution.

[3]Based on density of 0.83 gm/cc.

[4]Taste and Odor threshold standards of 0.1 to 0.5 mg (Ineson and Packham 1967).

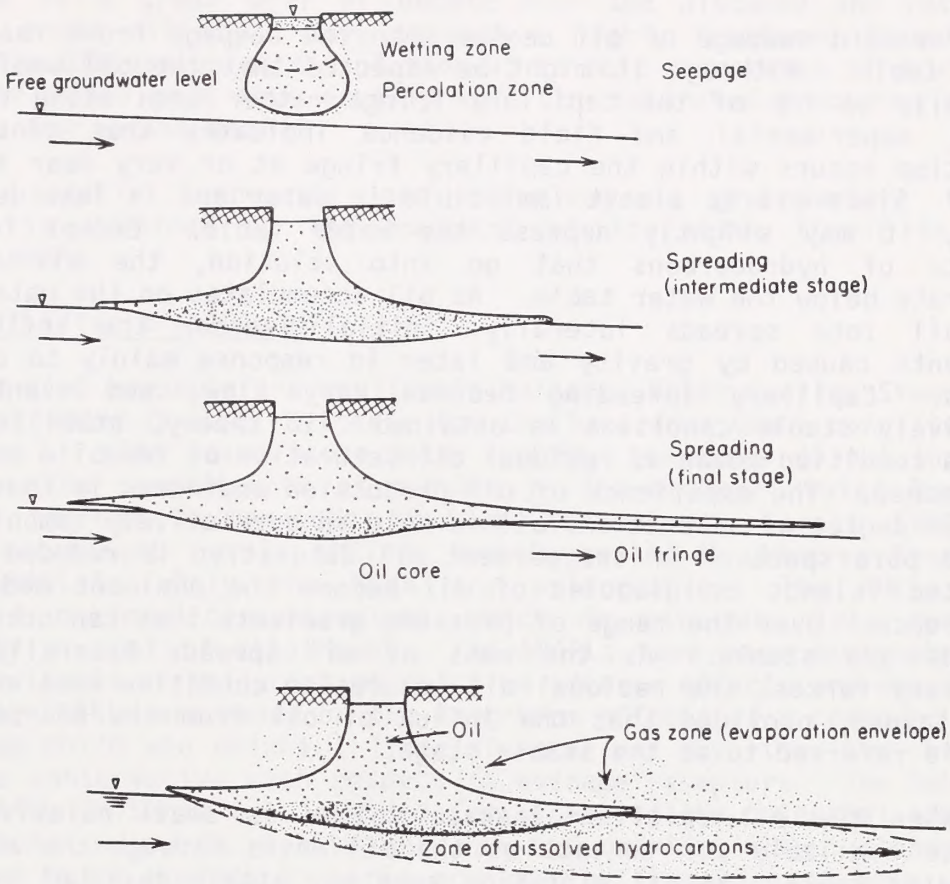


Figure A1-1. Migration of Oil Seeping from a Surface Source Followed by Migration of Dissolved and Gaseous Hydrocarbons from a Zone of Oil above the Water Table (after Schwille 1967)

forces. During this seepage stage, capillary forces produce some lateral migration. This causes a zone, referred to as the oil wetting zone, around the core of the infiltration body. It is comparable in origin to the natural capillary fringe on the water table. In the oil wetting zone, the degree of oil saturation decreases outwardly, and capillary forces (surface tension) are dominant. In the main seepage zone, only gravitational forces exist.

Downward seepage of oil ceases when the seepage front reaches the water table. Although it might be expected that the oil would spread laterally on top of the capillary fringe rather than along the water table, experimental and field evidence indicates that considerable migration occurs within the capillary fringe at or very near the water table. Since oil is almost immiscible in water and is less dense than water, it may slightly depress the water table. Except for small amounts of hydrocarbons that go into solution, the oil does not penetrate below the water table. As oil accumulates on the water table, the oil zone spreads laterally, initially under the influence of gradients caused by gravity and later in response mainly to capillary forces. Capillary spreading becomes very slow, and eventually a relatively stable condition is attained. In theory, stability occurs when a condition known as residual oil saturation or immobile saturation is reached. The experience of oil production engineers is that below a certain degree of saturation, oil is held in a relatively immobile state in the pore spaces. If the percent oil saturation is reduced further, isolated islands or globules of oil become the dominant mode of oil occurrence. Over the range of pressure gradients that can occur, these islands are stable. As the mass of oil spreads laterally due to capillary forces, the residual oil saturation condition must eventually be attained, provided that the influx of oil from the source ceases. This is referred to as the stable stage.

When the oil spill or leakage volume is small relative to the surface available for contact as the oil moves through the zone above the water table, the oil migration zone may attain residual saturation and become immobile before penetrating the water table.

Because oil leakages or spills usually do not involve large fluid volumes of oil, and because migration is limited by residual oil saturation, one might expect that oil is not a significant threat to groundwater quality. This is unfortunately not the case. Crude oil and its derivatives contain hydrocarbon components that have significant solubility in water. In general, the lighter the petroleum derivative, the greater is the solubility. Because the solubility of the lighter hydrocarbons greatly exceeds the concentration levels at which water is considered to be seriously polluted, it is not difficult to envision situations where the effect of hydrocarbon dissolution is of much greater concern in terms of groundwater quality than the localized immobile zone of immiscible hydrocarbons on and above the water table. For example, in the situation represented in the bottom-most diagram in Figure A1-1, the lateral flow of groundwater beneath the zone of immobilized oil could cause soluble hydrocarbons to be transported large distances along the groundwater flow paths (Freeze and Cherry 1979).

1.3 Behavior of Crude Oil in Fractured Media

The migration of crude oil in fractured media is not as well understood as its migration through porous media. Figure A1-2 is a conceptual cross-section of the Edwards Aquifer which illustrates the complexity of flow found in fractured media.

There is a great deal of debate over the distance and rate of migration crude oil would move through a highly fractured limestone. However, the discussion on dissolution of soluble components of crude in groundwater would hold true equally well for saturated fractured media as well as for porous media.

Once soluble components are dissolved in groundwater, their migration is governed by the movement of the water itself in the fractured media.

1.4 Health Effects of Crude

Table A1-6 presents the applicable National Water Quality Standards and Ambient Water Quality Criteria for the hazardous trace constituents of crude oil. (The Texas State Water Quality Standards do not include levels for the constituents of concern.) The National Water Quality Standards include Recommended Maximum Contaminant Levels (RMCLs), Maximum Contaminant Levels (MCLs), and Suggested No Adverse Response Levels (SNARLs). Only the MCLs are enforceable. The RMCLs are recommended maximum concentrations which do not take into account feasibility or cost of attainment. The SNARLs have been designated by EPA as the levels of pollutant at which no adverse effects are expected. The chronic SNARLs are based on the long-term effects of a compound on a 10-kilogram child who drinks 1 liter of water per day, thus the chronic levels are conservative with respect to average receptors. The Ambient Water Quality Criteria are intended for assessing the potential effects of pollutants on public health and are not drinking water standards. The Ambient Water Quality Criteria account for ingestion of both water and aquatic organisms that contain elevated levels of contaminants. Thus, the Criteria are estimates of pollutant concentrations that when not exceeded will ensure water quality safe for humans, and in the case of potential carcinogens give a low level of incremental cancer risk.

The most conservative criteria and standards were used in Tables A1-3 and A1-4 to calculate the volume of water that could be contaminated by trace constituents to significant (based on referenced water quality standards) health risk levels.

In the case of total dissolved hydrocarbons, the taste and odor threshold was used in Table A1-5 to determine the significant impact level, since in Texas, the Region VI EPA relies on: 1) taste and odor criteria; and 2) visual sheen, to determine if a clean up is complete.

1.5 Threshold Size of Aquifer - Polluting Oil Spills

A crude oil spill's effect on an aquifer is governed by many variables, among them being spill size, nature of the crude, aquifer properties (refer to Table 3-1a) and rate of groundwater movement. The

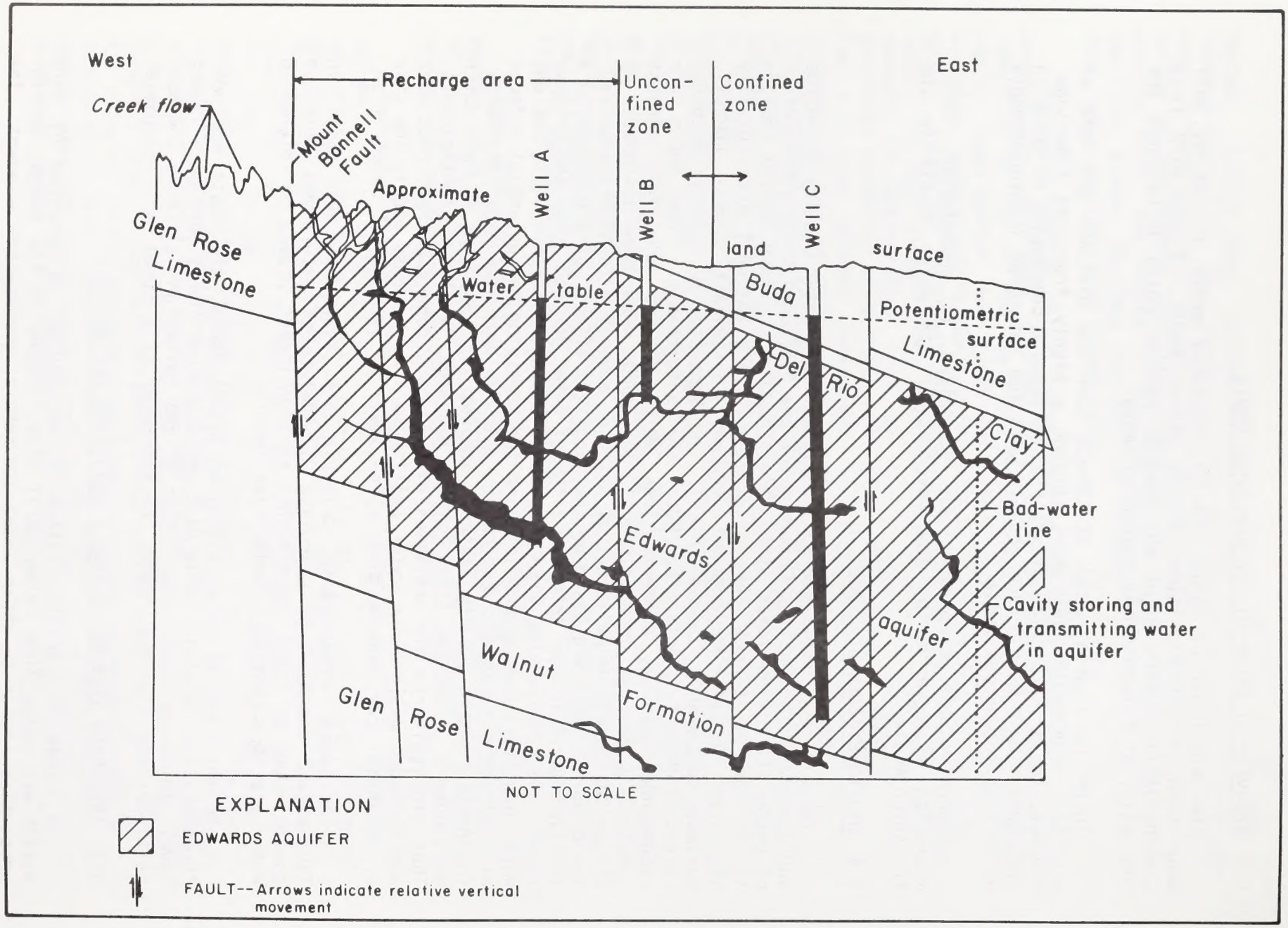


Figure A1-2. Conceptual Cross Section of the Edwards Aquifer Depicting Cavity Distributions (from Slade et al., 1986)

TABLE A1-6

WATER QUALITY STANDARDS AND CRITERIA

(ALL CONCENTRATIONS IN mg/l)

Compound	Drinking water standards		SNARL[3]		Ambient Water Qaulity Criteria for Protection of Human Health (Ingesting Water and Organisms)	
	RMCL[1]	MCL[2]	Acute	Chronic	Toxicity	Carcinogencity[4]
benzene	0	0.005[5]		c[6]		0.00066
toluene	2.0[5]		420	0.34	14.3	
ethylbenzene	0.68[5]				1.4	
xylene (total)			12	0.62		
antimony					0.146	
cadmium[8]	0.005[5]	0.010	0.15	0.005	0.01	
nickel[8]					0.0134	
copper[8]	1.3[5]					
lead[8]	0.020	0.05			0.05	
mercury	0.003[5]	0.002			0.000144	
phenanthrene						
fluoranthene						
pyrene						
benzo(a)anthracene						
chyrsen					Total PAH	
benzo(b)fluoranthene					2.8×10^{-6}	
benzo(k)fluoranthene						
benzo(a)pyrene						
benzo(g,h,i)perylene						

[1]RMCL=Recommend Maximum Contaminant Level

[2]MCL = Maximum Contaminant Level

[3]SNARL=Suggested No Adverse Response Level

[4]For incremental increased lifetime cancer risk of 10^{-6}

[5]Proposed value

[6]Suspected carcinogen, no chronic SNARL calculated by National Academy of Sciences

[7]Value is for individual chemicals or for combinations of these chemicals

[8]Ambient water quality criteria based on water hardness equal to 50 mg/l $CaCO_3$

following discussion 1) does not take into account aquifer properties or rate of groundwater movement and 2) assumes that the entire spill volume comes in contact with a given aquifer. This discussion provides an indication of the maximum impact an oil spill might have on an aquifer.

Tables A1-3, A1-4, and A1-5 illustrate the possible effects that 1,000 barrels of crude and 4,500 barrels of crude could have on the Edwards Plateau Aquifer (fractured media) and the Carrizo-Wilcox Aquifer (porous media). These tables suggest that 1,000 barrels introduced to the groundwater could cause water from up to 2.21 percent of the Edwards Plateau Aquifer and up to 2.48 percent of the Carrizo-Wilcox Aquifer to contain benzene quantities at the carcinogenic level (0.00066 mg/l) and that the same 1,000 barrels could contaminate 7 to 36 percent of the Edwards and 8 to 40 percent of the Carrizo-Wilcox to taste and odor thresholds for crude oil, assuming 10 percent of the crude goes into solution in the groundwater. Thus 1,000 barrels could affect a significant portion of these aquifers based on taste and odor threshold values; however, toxic effects from compounds of concern would be spatially limited to nearby wells.

Referring to the same tables, 4,500 barrels introduced to groundwater spill could cause up to 9.9 percent of the Edwards and 11.2 percent of the Carrizo-Wilcox waters to contain carcinogenic levels of benzene. In addition, the same volume of crude could contaminate 32 to 161 percent (i.e. 1.61 times the volume) of the Edwards and 36 to 180 percent of the Carrizo-Wilcox to taste and odor thresholds levels. Thus, a 4,500 barrel of crude could significantly impact these aquifers from both a toxicity and a taste and odor standpoint.

The catastrophic oil spill scenario (Appendix B, of the Final SEIS) indicated that given the right conditions, a 3,230-barrel spill in the Edwards Balcones Fault Zone recharge area could significantly impact 34 percent of the Edwards Balcones Fault Zone aquifer.

The 2,300-barrel Shell Pipeline Oil Spill in Travis County, Texas produced measurable contamination in a "perched zone" at a depth of 33 ft. No other measurable contamination was found at greater depth as of May 1987; however, the investigation was still ongoing at that time. Please refer to page 4-23 for additional details on this spill.

MODIFICATIONS AND CORRECTIONS TO PAGE A-8

This section replaces page A-8 of the Draft SEIS, beginning with the "Composite Calculations - Spill Volume" section.

2.4 Spill Volume Prediction

AAPL Spill Rate = 1.506 barrels per mile-year

Proposed Route = 485.7 miles, 7.8 spills in 40 years

(1.506)(485.7) = 731 barrels per year
= 29,259 barrels in 40 years = 3,751 barrels per spill

Northern Alternative = 545.7 miles, 8.8 spills in 40 years

(1.506)(545.7) = 822 barrels per year
= 32,873 barrels in 40 years = 3,736 barrels per spill

Southern Alternative = 537.8 miles, 8.6 spills in 40 years

(1.506)(537.8) = 810 barrels per year
= 32,397 barrels in 40 years = 3,767 barrels per spill

In the recharge zone, the spill rate is 0.601 barrel per mile-year

Edwards Aquifer = 6.4 miles, 0.057 spills in 40 years

(0.601)(6.4) = 4 barrels per year
= 154 barrels in 40 years = 2,699 barrels per spill

MODIFICATIONS AND CORRECTIONS TO PAGE A-9

This section replaces Section 2.4, Spill Volume Prediction, on page A-9 of the Draft SEIS.

Composite Calculations - Spill Volume

Generic Spill Factors: Leaks = 0.303 barrel per mile-year
Ruptures = 1.853 barrels per mile-year

Correction Factors:

	Leak	Rupture
Pipe Diameter	5.500	5.500
Leak Detection	0.800	0.200
Composite	4.400	1.100

AAPL Spill Factors

Leaks = (0.303)(4.400) = 1.333 barrels per mile-year
Ruptures = (1.853)(1.100) = 2.038 barrels per mile-year

Given: Leaks = 75.4 percent of spills
Ruptures = 24.6 percent of spills

Mean Spill Rate is given by:

(1.333)(0.754) + (2.038)(0.246) = 1.506 barrels per mile-year

Correction Factors at Edwards Aquifer:

	Leak	Rupture
Rate Reduction	0.559	0.559
Remote Control Valves	1.000	0.139
Composite Factor	0.559	0.078

AAPL Spill Factors at Edwards Aquifer:

Leaks = (0.303)(4.400)(0.559) = 0.745 barrel per mile-year
Rupture = (1.853)(1.100)(0.078) = 0.159 barrel per mile-year

Mean Spill Rate at Edwards Aquifer:

(0.745)(0.754) + (0.159)(0.246) = 0.601 barrel per mile-year

MODIFICATIONS AND CORRECTIONS TO PAGE B-15

This section replaces Section 2.5 on page B-15 of the Draft SEIS.

2.5 Spill Detection and Response Procedures

Possible oil spills from the All American Pipeline may be detected by several means. The primary detection means is the computerized pipeline leak detection and monitoring system. Other leak detection methods employed by All American Pipeline Company (AAPL) include regular aerial reconnaissance of the pipeline route and surveys by AAPL ground crews during the performance of their routine operational and maintenance activities. Outside parties such as property owners along the route may also detect spills and notify local officials (i.e. county sheriff or fire department) who would then notify AAPL.

The initial response to an oil spill is notification of the National Response Center (NRC) which coordinates notifications of pertinent Federal Agencies, appropriate State contacts [in Texas (800) 245-4545 or (212) 323-7111], and appropriate corporate personnel that a spill has taken place. Concurrent with notification of the NRC is initiation of the emergency shutdown system, if appropriate. Detailed reporting steps are described in Section 2.6 below.

The emergency shutdown system can function in two modes. The first is to shutdown all oil flow into the leak location. This could be done by initiating an emergency system stop, in which case the computer-operated supervisory control system would automatically begin stopping all operating pump units in a predetermined sequence and closing pump isolation valves. Alternately, the Pipeline Dispatcher may choose to keep some pumping units downstream of the leak location on-line, while shutting down only those pump stations upstream of the leak. This procedure serves to reduce the oil flow into the leak area while maintaining suction pressure on the downstream side in order to hinder the return flow of oil to the leak location from the downstream side. In addition, retaining downstream pumping pressure helps reduce the pipeline pressure in the event of a small leak, thus reducing the rate at which the oil leaks from the pipeline.

After all pump stations have been shutdown, the Pipeline Dispatcher will take action to close remotely operated pipeline block valves in the area of the leak. In the event that valves in the areas are not remotely operated, valve closure will be performed by the repair and cleanup crew after arrival at the spill site.

After notification of appropriate personnel and agencies and after shutdown, the location and spill size are determined. In some circumstances, the location of the oil spill may not be immediately known. This may be the case if the leak is below the detection limits of the supervisory control system, and oil is visually detected, such as on a river or waterway downstream of the pipeline. In such circumstances, the District Superintendent will initiate field reconnaissance activities in conjunction with the spill cleanup. Reconnaissance activities might include aerial surveillance or ground

patrols along the area of the suspected leak. In the event of a small leak, the pipeline would not be shutdown entirely until the location of the leak were determined. Premature closing of the line could result in the leak closing off before detection and result in field crews being unable to locate and repair the fault. This would result in the leak reappearing upon system restart. Under these circumstances, the pipeline would continue operation, albeit at a lower operating pressure and flow, until the leak could be isolated. After the leak location was firmly detected, the pipeline would be shutdown to permit repair operations to begin.

Oil spill containment and cleanup actions will be directed by the AAPL Oil Spill Coordinator under the oversight of the Federal Oil Spill Coordinator or his designate. The containment and cleanup actions are taken so as to protect public safety, minimize the damage to the environment from the oil, and maximize the recovery of lost oil. Different procedures for spill containment and cleanup may be required depending on the circumstances of the spill. Potential cleanup and containment procedures are discussed in greater detail in Section 3.0 of Appendix B.

3.4 IMPACT SUMMARIES

This section of the Final SEIS summarizes the significant impacts associated with each alternative, by resource. These narrative summaries supplement the impact summary tables for the alternatives (Tables 4-63, 4-64, and 4-65) located at the end of Appendix A of the Final SEIS.

3.4.1 Impact Summary - Proposed Route

System Safety and Reliability

An impact summary is not considered necessary for this discipline because it is not considered an environmental resource. This discipline describes the safety and reliability of the operation of the pipeline, which is important in defining the risks to environmental resources.

Groundwater

Significant operational impacts to groundwater resources could occur in the event of pipeline leaks or spills. The Proposed Route crosses 404 miles of seven aquifers that are sensitive to potential contamination by oil spills. Those aquifers are the Edwards-Trinity Plateau, Trinity Group, Edwards Balcones Fault Zone, Carrizo-Wilcox, Gulf Coast, Queen City, and Sparta Aquifers (refer to Tables 3-1 and 3-1a in the Modifications and Corrections section of the Final SEIS for aquifer properties).

The areas of highest sensitivity to an oil spill on the Edwards Plateau are cities and towns with groundwater supplies and important springs discharging from this aquifer. The entire Edwards-Trinity Plateau Aquifer is considered to be sensitive; however, there are local variations in aquifer conditions which limit the potential adverse effects of an oil spill in some areas and cause other areas to be highly sensitive. Occurrence of an oil spill in an unfractured area or where fractures are filled with marl or soil would most likely be cleaned up at the surface before a significant volume of oil could infiltrate to depth. If a spill occurred and entered a zone of open fractures or solution channels, then oil could migrate relatively rapidly through these zones.

Along the Proposed Route, typical depth to groundwater is 200 to 500 ft below the plateau surface. Of several possible sensitive receptors, the following would have the greatest chance of impact by an oil spill. The City of Ozona, because of heavy pumping, experiences groundwater movement toward the city, in spite of the fact that under normal conditions the city is upgradient of the Proposed Route. Groundwater that becomes part of spring flow or emerges from springs and then enters Kimble County as the base flow of streams could be affected. And finally, individual private and domestic wells located in the immediate downgradient vicinity of a spill could be affected.

The route's crossing of the Edwards Balcones Fault Zone Aquifer is especially sensitive to potential contamination because of its high permeability, rapid recharge, and fracture dominated flow characteristics. The Edwards Balcones Fault Zone Aquifer is governed by complex hydrogeologic processes, and it is extremely difficult to predict the behavior of an oil spill in such an aquifer. The geology of

this aquifer ranges from tight Manley limestones, in which flow is more similar to that of pourous media, to highly fractured, vugular and cavernous limestone, in which flow is primarily governed by local solution channel characteristics. Flow in the fractured media, on a very local scale, may actually go against the regional groundwater gradient.

The Proposed Route of the All American Pipeline would cross the Edwards Balcones Fault Zone Aquifer in the area which primarily recharges the Austin subarea of the aquifer. However, the route would lie 0.25 mile to the north of the groundwater divide which separates the Austin subarea from the San Antonio subarea of the aquifer. While an oil spill in this vicinity would probably move toward the Austin subarea and Barton Springs (20 miles north of the route), the possibility of movement toward the San Antonio subbasin (a sole-source aquifer) and San Marcos Springs (7 miles south of the route) cannot be ruled out. Sensitive receptors closer to the route, including wells supplying the cities of Buda, Kyle, Hays, Manchaga, Sunset Valley, and privately owned water supply wells in the area, also have the potential to be affected by an oil spill. Depending on the flow conditions, any of these areas would be downgradient of the pipeline.

Depth to groundwater in these areas ranges from approximately 650 to 525 ft below ground surface. Given the extreme vertical and lateral variations in the structure of the limestone, it is difficult to predict how readily spilled crude would penetrate any given stretch of the recharge zone. Highly fractured, cavernous areas would be more extensively affected than tight, massive areas. This aquifer is important as a municipal water supply, recreational resource, and as a unique ecosystem.

In Gillespie County, the Hensell Sand overlying the Ellenberger Aquifer consists of poorly sorted sand, silt, and clay with beds of limestone. The upper part of the member is generally fine-grained, while the lower part consists of coarse, angular sand. The communication between the course more permeable lower Hensell Sand and the upper portion of the Ellenberger Aquifer does not give an indication of the ease or difficulty a surface oil spill would have in penetrating the upper finer grained Hensell and reaching the water table. In general, the rate and extent of subsurface oil migration is slower and less extensive in porous granular aquifers. The Ellenberger as a whole is not regarded as sensitive. However, in Gillespie County, the City of Fredericksburg has 5 water supply wells located less than 0.5 mile south of the Pedernales River and 1,000 ft north of the Proposed Route. Because of the uncertainty in the communication between the Hensell Sand and the Ellenberger Aquifer in this area and because the Pedernales River may complicate the local hydrogeology, the area within 2,000 ft of any supply wells for the City of Fredericksburg is considered sensitive.

The Carrizo-Wilcox Aquifer crosses the Proposed Route in Caldwell and Bastrop Counties. The shallow depth to groundwater and high degree of groundwater use for municipal, domestic, and other purposes combine

to make this aquifer sensitive to potential oil spill impacts. Impacts would be limited to the aquifer recharge area because oil would not migrate downdip into the confined portions of the aquifer. Subsurface oil spill migration and behavior in the granular aquifer is more predictable than in fractured limestone aquifers. Therefore, a smaller area is likely to be affected during the time between a spill event and implementation of cleanup measures.

The municipalities of Ozona, Sonora, Kyle, Fredericksburg, Weimar, Eagle Lake, East Bernard, Rosenburg, and Alvin rely on water supplies within 2 miles of the Proposed Route, have populations of over 1,000, and use groundwater as their primary source of drinking water. Table 3-3 of the Final SEIS lists 10 springs which lie within 0.2 to 31 miles of the Proposed Route.

A total of 6.5 oil spills are estimated over a 40-year pipeline life within any sensitive aquifer along the Proposed Route (4.017×10^{-4} spills per mile-year x 404 miles x 40 years). The probability of a spill within the Edwards Aquifer recharge zone (6.4 miles) and tributary Onion Creek basin (20 miles) is calculated to be 0.38 spills in 40 years [(2.246×10^{-4} spills per mile-year x 6.4) + (4.017×10^{-4} spills per mile-year x 20) x 40 years]. The average spill size for the All American Pipeline has been estimated as 3,750 barrels. A detailed discussion of crude oil properties, aquifer pollution, and potential health effects is included in Modifications and Corrections Section 3.3 in reference to Draft SEIS Appendix A Sections 1.1 through 1.5.

Considering the historically low incidence of groundwater contamination resulting from reported oil spills and the response measures included in the Oil Spill Contingency Plan, not all of the predicted oil spills would result in significant impacts. There is, however, a small probability that significant impacts to groundwater quality could occur during the operational life of the project. Impacts would probably be of limited extent (i.e., <<2 miles downgradient) and duration (i.e., several months to years). Under some conditions (e.g., fissured limestone aquifers with rapid recharge) the extent of contamination by disolved crude oil constituents may be greater; however, the duration of impacts could be much shorter.

Surface Water

The Proposed Route crosses 93 named water bodies, of which 11 are perennial streams and 82 are intermittent. Eight of the water bodies are considered major in terms of the size of the channel, occurrence of downstream water users, and volume of water (Table 4-11). There would be no significant impacts to these water bodies during construction. A major oil spill or leak would degrade water quality below federal and state standards and affect downstream users. These would represent potential significant impacts to the major crossings. Other values of the water bodies (e.g. aquatic biology, recreation) are discussed in these disciplines. The proposed route crosses three streams, the South Llano, Pedernales, and the Brazos Rivers which supply municipal water to the towns and municipalities of Junction, Llano, Llano Municipal Water District, Johnson City, and Freeport. The Town of Junction is 10 miles

downstream of the crossing. The Proposed Route is upstream of two major reservoirs, Lake Lyndon B. Johnson and Lake Travis. However, the pipeline crossings are more than 100 miles upstream of each reservoir.

Geology

Construction impacts along the Proposed Route could consist of blasting-induced damage to the Caverns of Sonora along with blasting-induced sinkhole development or subsidence in other karstic areas, notably Kerr County.

Pipeline operations have the potential to impact the Caverns of Sonora by the migration of spilled oil through solution channels to the Caverns. However, the Caverns are located 1 mile away from the route, and the probability of significant impact appears very low.

There is some chance that faulting and seismicity, particularly in the Houston area, could result in damage to the operating pipeline. No significant impacts are expected because of low regional seismicity, small amounts of offset observed in active subsidence faults, and control of subsidence through groundwater withdrawal restrictions.

The highest potential for slope instability occurs at the Brazos River crossing where 30 ft high unconsolidated banks could be undercut by the river. Careful scrutiny of the potential for bank erosion at other planned crossings may indicate the need to modify the pipeline alignment slightly during construction to avoid locally unstable banks. Although intense rainfall and construction grading could cause unstable banks to fail, it is more likely that slope failures would develop progressively so that repair to a damaged or threatened portion of the pipeline could be made before rupture occurred.

If active karstic terrain were traversed by the pipeline, active sinkholes or subsidence resulting from karst conditions could result in pipeline rupture with subsequent oil spillage into limestone solution channels. This is considered a hazard. Avoidance of known or suspected sinkholes and frequent surveillance for signs of incipient failure would eliminate this hazard.

Kier et al. (1977) show a karst area immediately south of the route in Kerr County. The karst in the Edwards Plateau Region is generally considered to be inactive or of such a small scale (Rose 1972; and Morton 1974) that it would not significantly affect the pipeline operation.

Soils

No significant impacts to soil resources would occur with the implementation of sound mechanical erosion control and revegetation techniques. Impacts to soils resulting from oil pipeline leaks and ruptures would not be significant since the relatively small areas affected would be rehabilitated by AAPL within a 2-year period.

Aquatic Biology

Of the 93 streams that would be crossed by the Proposed Route, 10 contain important fish populations. These include the South Llano River, Pedernales River, Colorado River, San Bernard River, Brazos River, Oyster Creek, Chocolate Bayou, Mustang Bayou, Highland Bayou, and Clear Creek. Eighteen important fish species or species groups occur in these rivers, while the numbers of species in specific rivers range from one in Chocolate Bayou and Mustang Bayou to 16 in the Colorado River (Table 4-15). Two reservoirs, Lake Lyndon B. Johnson and Lake Travis, also are located downstream of the Proposed Route crossings. Both of these reservoirs contain important fish populations with 11 and 14 species or species groups, respectively. Two additional streams, the San Marcos and Comal Rivers, are included in the study area because the Proposed Route would interact with the Edwards Aquifer. Three estuaries or coastal areas also could be affected by the Proposed Route due to an oil spill: Galveston Bay system, Matagorda Bay, and the Gulf of Mexico near Freeport and Surfside.

Significant impacts could occur if a lubricant or fuel spill reached important water bodies or blasting occurred during construction. Significant impacts would occur during operation if an oil spill entered the streams, reservoirs, or coastal areas listed above. Important fish populations that could be affected include both game fish and threatened and endangered species in freshwater environments and finfish, shrimp, crab, and oysters in the marine environments (Tables 4-15 and 4-18). Two federally-listed species, the San Marcos gambusia and the fountain darter, could be affected if oil entered Spring Lake and the San Marcos River via the Edwards Aquifer (Table 3-9). Similarly, two federal candidate fish (widemouth blindcat, toothless blindcat) and six federal candidate invertebrates could be affected if oil entered the Edwards Aquifer. In addition, three federal candidate fish (smalleye shiner, sharpnose shiner, and Guadalupe bass) could be affected if oil entered rivers listed in Table 3-9.

Terrestrial Biology

Pipeline construction would disturb a total of 5,887 acres along the 486-mile Proposed Route. Approximately 1,264 acres (104 miles) of this disturbance from McCamey to Sonora have been previously cleared along the pipeline ROW. The majority of the disturbance along the entire route would affect the oak-mesquite-juniper type and agricultural lands. Approximately 138 acres of riparian habitat would be removed; a significant impact. Construction activities in nine counties with areas of oak wilt disease (from Kimble to Colorado Counties) would likely spread the disease to adjacent disease-free areas unless controlled. Construction and/or the possibility of a pipeline oil leak or rupture during operation of the project has the potential of affecting two federally-listed or proposed wildlife species: bald eagle and blacked-capped vireo, with an impact rating of 1 or 2 (1: adversely affect a portion of the population; 2: adversely affect several individuals). In addition, the project has the potential of significant impacts to 11 federal candidate or state-classified endangered or threatened animal species with an impact rating of 3 (3: adversely affect several

individuals or reduce habitat). No federal or state-listed or proposed threatened or endangered plant species are known to occur within or adjacent to the proposed ROW. Nine known locations of federal candidate and/or state sensitive (TNHP) plant populations occur within a 6-mile wide corridor; in addition one TNHP natural community occurs within the corridor. Based on occurrence information provided by TNHP, six of these locations potentially would be crossed by the Proposed Route, a significant impact.

Cultural Resources

Most of the direct impacts to cultural resources are expected to be incurred during the construction phase. Conversely, few indirect impacts are likely to result during construction. Impacts are therefore most apt to occur within the actual 100-ft wide construction ROW. Ninety-nine sites are known to exist within the 100-ft wide construction ROW for the Proposed Route. Prehistoric site types include burned rock middens, miscellaneous burned rock features, quarries, and lithic scatters. Historic site types include intact structures, wells/ cisterns, dumps, and artifact scatters. Past research in the general vicinity of the pipeline corridor suggests that site type variability is in fact greater than the inventory of know sites suggests.

Few sites have been evaluated for National Register eligibility. Although some of the numerous sites recorded during Texas A&M University's partial survey of the proposed pipeline route were shovel tested, the testing was conducted mainly for the purpose of establishing horizontal site limits and did not exceed 50 centimeters in depth (Mueller-Wille 1986). The vertical extent of the sites is unknown, and for management purposes they must be regarded as unevaluated. In addition to the inventory of recorded sites, there are unrecorded sites in unsurveyed portions of the route, many of which may be significant. Significant direct impacts to both known and unrecorded cultural resources are certain to occur as a consequence of ground-disturbing activities associated with the construction phase.

Indirect impacts to significant cultural resources are most likely to occur during the projected 40-year operating life of the project. Such impacts would tend to occur outside of the 100-ft construction ROW. However, the probability that a given cultural resource would be subject to indirect impact decreases with increased activity associated with facilities operation itself. Twenty-six sites are known to exist in the pipeline corridor vicinity but exterior to the actual construction ROW. Significance data for these sites are largely unknown. The number of sites which actually exist within the 1-mile study corridor straddling the line is unknown. The potential for significant and long-term impacts of an indirect nature is quite high; however, it cannot be quantified without vastly increasing the cultural resource data base along the entire mile-wide corridor.

Abandonment activities are similar to those associated with construction in the sense that they involve surface and subsurface disturbance. However, all such activities should take place in areas previously disturbed during pipeline construction, and it is unlikely

that previously undisturbed cultural sites would be subjected to significant direct impact.

Paleontology

Most impacts to paleontological resources would be incurred during the construction phase of the project. Impacts are most apt to occur within the actual 100-ft construction ROW and could be caused by any ground-disturbing activities, whether at or near the surface or deeply subsurface. The degree to which any of the various construction-related activities (clearing/grading, ditching, boring, etc.) may adversely affect paleontological resources depends on the nature and depth of geological formations at any given location.

Significant impacts may occur where any of the units designated as high or medium sensitivity are crossed by the pipeline route. High sensitivity units crossed by the pipeline are the Cook Mountain Formation (east-cultural portion of route), Oakville and Fleming Formations (Fayette-Colorado County vicinity), and Beaumont Formation (Wharton County to east end of route). Medium sensitivity units are the Glen Rose Formation (Kimble-Kendall County vicinity), Eagle Ford Group and Buda Formation (Austin-San Marcos vicinity), caves on the Edwards Plateau, and Pleistocene Terraces. Terraces can occur at stream crossings anywhere along the route. Of particular concern are the crossings of the Pedernales River, Colorado River, Onion Creek, Live Oak Draw, and Johnson Draw.

Both of the known paleontological localities along the corridor are in formations rated as highly sensitive (Fleming and Beaumont Formations). Significant impacts could therefore occur at either locality.

Operation of the pipeline is unlikely to produce additional significant impacts to paleontological resources, particularly if activities are largely confined to the original construction ROW. The threat of significant impact to paleontological sites from abandonment activities is also small because all such activities would take place in areas previously disturbed during pipeline construction.

Air Quality and Meteorology

No significant impacts were identified for air resources.

Land Use and Recreation

There are no significant land use impacts under normal construction and operation procedures. Exotic and native game species could be significantly impacted on private game reserves if adequate fencing to protect these animals is not installed during construction activities. If an oil spill was to occur in a river, lake or estuary, many recreational resources and activities could be significantly impacted depending upon the location and severity of the spill. Table 4-32 describes these potentially impacted resources.

Socioeconomics

No significant impact from changes in area population, employment, or demands on public servies and facilities would be experienced along the Proposed Route. Five-year average occupancy rates for temporary housing along the route are not available; therefore, significant impacts on housing cannot be quantified. It is assumed that in central Texas, along the western portion of the line, short-term adverse impacts on housing may occur along the sparsely populated segments of the pipeline, but these do not represent significant impacts.

Transportation

Transportation effects from development of the All American Pipeline on the Proposed Route would not be significant.

Visual Resources

Visual contrast from construction and operation of the All American Pipeline would achieve the standards of the BLM Visual Resource Management Class objectives along most of the Proposed Route. The only significant adverse visual impact would occur at the crossing of U.S. Highway 377 and the South Llano River. Visual effects would be significant in this limited area because the existing scenic quality of the narrow valley is both high and unusual for the area and because the access afforded by the highway provides visibility to the general public. Application of recommended mitigating measures (VR-1) would reduce the visual impact to non-significant levels.

Noise

Construction of the All American Pipeline on the Proposed Route could generate noise levels in excess of the 65 dBA significance threshold at more than 500 homes, depending on individual site conditions. Although significant, these noise impacts would be limited to less sensitive daylight hours and would affect individual homes for only 2 to 3 weeks out of the 6-month construction period. Application of standard mitigation measures such as compliance with OSHA standards and use of effective equipment mufflers would not achieve the 65 dBA criterion, but more stringent measures would not be warranted because of the extremely short duration of the impact.

Operation of the pipeline would cause long-term noise in excess of 65 dBA at only one or possibly two homes near the Seguin pump station. Application of recommended Mitigation Measure N-1 would reduce operating noise to non-significant levels at noise sensitive receptors near the Seguin station.

Abandonment of the pipeline in place would not result in significant noise effects. Salvage of the pipeline would result in noise impacts similar to those described for construction.

3.4.2 Impact Summary - Northern Alternative

System Safety and Reliability

An impact summary is not considered necessary for this discipline because it is not considered an environmental resource. This discipline describes the safety and reliability of the operation of the pipeline, which is important in defining the risks to environmental resources.

Groundwater

The 546-mile Northern Alternative from McCamey to Webster and Texas City crosses outcrops or recharge zones of four major and two minor aquifers. Using the criteria described in Section 3.2.2 in the Draft SEIS to identify sensitive areas of aquifers, there are 332 miles of sensitive aquifer outcrops and/or recharge zones crossed by the Northern Alternative.

From west to east, the Northern Alternative traverses the following sensitive aquifers: Edwards-Trinity Plateau, Trinity Group, Carrizo-Wilcox, Queen City, Sparta, and Gulf Coast (refer to Tables 3-1 and 3-1a in the Modifications and Corrections section of the Final SEIS for aquifer properties).

The Northern Alternative would cross 117 miles of the Edwards-Trinity Plateau Aquifer. The entire Edwards-Trinity Plateau Aquifer is considered to be sensitive; however, there are local variations in aquifer conditions which limit the potential adverse effects of an oil spill in some areas and cause other areas to be highly sensitive. Occurrence of an oil spill in an unfractured area or where fractures are filled with marl or soil would most likely be cleaned up at the surface before a significant volume of oil could infiltrate to depth. If a spill occurred and entered a zone of open fractures or solution channels, then oil could migrate relatively rapidly through these zones.

The counties that obtain groundwater from the Edwards-Trinity Plateau Aquifer along the Northern Alternative consist of Upton, Reagan, Irion, and Tom Green. Of the several possible sensitive receptors outlined in page 3-114 of the Modifications and Corrections section of the Final SEIS, two cities are most likely to be impacted by a spill. The City of Barnhart appears to be downgradient from the Northern Alternative. In the southern portion of Tom Green County, the City of Christoval, which obtains groundwater from shallow wells and springs of the Edwards and associated limestones, is downgradient from the pipeline.

The Northern Alternative crosses the Carrizo-Wilcox Aquifer in Milam and Burleson Counties. This aquifer is overlain by 9 to 75 feet of Brazos River alluvium along portions of the Northern Alternative. The Carrizo-Wilcox water supplies that may be affected by an oil spill include the Cities of Rockdale and Minerva as well as domestic and livestock wells along this route. Very shallow wells drawing from the Brazos River alluvium or other thin alluvial deposits along the route could also be affected. The shallow depth to groundwater (30 to 75 ft)

and high degree of groundwater use make the recharge zone of this aquifer sensitive to oil spill impacts. The confined downdip portion of the aquifer would not be affected by oil spills.

Subsurface oil spill migration and behavior in the granular aquifer is more predictable and more easily mitigated than in fractured limestone aquifers. Therefore, a smaller area is likely to be affected during the time between a spill event and implementation of cleanup measures. Please refer to Modifications and Corrections Section 3.3 for Appendix A Sections 1.1 through 1.4 for detailed discussions on crude oil properties and behavior. Section 1.5 of the same appendix discusses threshold spill sizes for aquifer pollution based on health criteria as well as taste and odor criteria.

The Northern Alternative avoids the highly sensitive Edwards Balcones Fault Zone Aquifer recharge area. Where the route crosses the Edwards Formation west of McGregor, the aquifer occurs in the subsurface, in a non-faulted condition, and outcrops in relatively small exposures along incised valleys. The City of McGregor obtains about 30 percent of its water supply from wells tapping the Edwards Limestone, which is a confined aquifer in the McGregor area.

The municipalities of Rankin, Big Lake, Rockdale, Sealy, Wallis, Rosenberg, and Alvin rely on water supplies within 2 miles of the route, have populations of over 1,000, and use groundwater as their primary source of water. There are also numerous smaller towns, ranches, homes, and agricultural wells located within 2 miles of the Northern Alternative which similarly depend upon groundwater supplies. Table 3-3 in the Modifications and Corrections section of the Final SEIS lists seven springs which lie between 1 to 26 miles of the Northern Alternative.

The probability of an oil spill is calculated to be 5.3 spills over a 40-year pipeline life within any sensitive aquifer along the Proposed Route (4.017×10^{-4} spills per mile-year x 332 miles x 40 years). The average spill size for the All American Pipeline has been estimated as 3,750 barrels.

Considering the historically low incidence of groundwater contamination resulting from reported oil spills and the response measures included in the Oil Spill Contingency Plan, not all of the predicted oil spills would result in significant impacts. There is, however, a small probability that significant impacts to groundwater quality could occur during the operational life of the project. Impacts would probably be of limited extent (i.e., <<2 miles downgradient) and duration (i.e., several months to years). Under some conditions (e.g., fissured limestone aquifers with rapid recharge) the extent of contamination by dissolved crude oil constituents may be greater; however, the duration of impacts could be much shorter.

Surface Water

The Northern Alternative crosses 116 named water channels, of which 8 are perennial streams and 108 are intermittent. There would be no

significant impacts to these water bodies during construction. A major oil spill or leak would degrade water quality below federal and state standards and affect downstream users. These would represent potential significant impacts to the major crossings. Other values of the water bodies (e.g. aquatic biology, recreation) are discussed in these disciplines. Fourteen of the crossings are major for the surface water discipline (Table 4-41). The Northern Alternative crosses nine streams which are municipal water supplies. The streams crossed are: South Concho, Colorado, Leon, Lampasas, South Bosque, Little River, Middle and East Yegua, and Brazos River. The towns and municipalities possibly impacted by an oil spill are San Angelo, Goldthwaite, Lower Colorado River Authority, McGregor, Gatesville, Cedar Park Water Supply Corp., Waco, Cameron, Brenham, and Freeport. The Northern Alternative crosses the Little River 7 miles upstream of Cameron's water supply. The Northern Alternative is upstream of seven reservoirs: Twin Buttes, Lake Buchanan, Belton, Stillhouse Hollow, Waco Lake, Cameron, and Lake Somerville.

Geology

Construction and operation of the pipeline along the Northern Alternative would result in impacts similar to those identified for the Proposed Route. The exception is that this route does not encounter unique geologic features. Both routes coincide in the Houston area, so that potential impacts caused by subsidence-induced surface faulting are the same. The impacts relating to karstic terrain are considered a smaller hazard for the Northern Alternative, since it crosses fewer miles of limestone and is not near known karstic terrain.

Two mineral and energy resource areas could be affected. The route crosses the proposed Shell Oil Milam coal mine northeast of Rockdale. The presence of the pipeline could adversely impact the mining plans for this deposit since the route crosses one corner of the proposed mine. Such an impact would be significant. The proposed mine could be avoided by slight route realignments.

The Northern Alternative crosses an area of energy and mineral extraction activities adjacent to the Orchard Dome in Fort Bend County. Past and/or current extraction includes oil, gas, sulfer, and gravel. Negotiation with landowners and minor route realignment, if appropriate, would be necessary to avoid significant interference with future development of these resources. The Mitigation Measure TB-10 for Attwater's greater prairie chicken will realign the ROW north of the current Orchard Dome development.

The Northern Alternative route crosses two areas of steep slopes on shale bedrock south of Spring Valley and west of Cameron with potential for soil creep, slumping, erosion, and shallow landslides. The risk of these types of failures is a potentially significant impact, pending results of more detailed geotechnical investigations.

Potentially unstable stream banks exist at the crossings of the Leon River and Middle Yegua Creek. Additionally, the route traverses steep slopes of active and inactive meander bends on the Brazos River at

the Austin-Fort Bend County line. Minor alignment changes may be required at the stream crossings. An alignment change to avoid the meander bend would eliminate the potentially significant impact.

Soils

No significant impacts to soil resources would occur with the implementation of sound mechanical erosion control and revegetation techniques. Impacts to soils resulting from oil pipeline leaks and ruptures would not be significant since the relatively small areas affected would be rehabilitated by AAPL within a two-year period.

Aquatic Biology

Of the 116 streams that would be crossed by the Northern Alternative, 16 contain important fish populations. These include Dove Creek, South Concho River, Colorado River, Pecan Bayou, Lampasas River, Leon River, Little River, Middle and East Yequa Rivers, South Bosque Creek, Brazos River, Oyster Creek, Chocolate Bayou, Mustang Bayou, Highland Bayou, and Clear Creek. Eighteen important fish species or species groups occur in these rivers, while the number of species in specific rivers range from one in Chocolate Bayou and Mustang Bayou to 16 in the Brazos and Colorado Rivers (Table 4-45). Other rivers with moderate numbers of important fish species include Leon River, Little River, and Clear Creek. Six reservoirs (Twin Buttes, Lake Buchanan, Belton, Stillhouse, Lake Somerville, and Waco) also are located downstream of the Northern Alternative. Numbers of important fish species ranges from 7 in Twin Buttes to 11 in Lake Buchanan, Belton Reservoir, and Waco Lake. Two coastal areas also could be affected by the Northern Alternative due to an oil spill: Galveston Bay and the Gulf of Mexico near Freeport and Surfside.

Significant impacts could occur if a lubricant or fuel spill reached important water bodies or blasting occurred in important streams during construction. Significant impacts would occur during operation if an oil spill entered the streams, reservoirs, or coastal areas listed above. Important fish populations that could be affected include both game fish and threatened and endangered species in freshwater environments and finfish, shrimp, crab, and oysters in the marine environments (Tables 4-18 and 4-45). No federally listed threatened or endangered species are known to occur in streams potentially affected by an oil spill. Three federal candidate fish species could be affected including the Guadalupe bass (Dove Creek, South Concho River, Brazos River, and Colorado River), smalleye shiner (Brazos River), and the sharpnose shiner (Brazos and Colorado Rivers) (Table 4-45). In addition, one federal candidate invertebrate (bifurated cave amphipod) could be affected if oil entered the Edwards Aquifer in eastern Coryell County.

Terrestrial Biology

Implementation of the Northern Alternative would disturb a total of 6,615 acres along the 546-mile route. The major habitat affected along this alternative would be agricultural lands. Approximately 121 acres

of riparian habitat would be removed; a significant impact. Construction activities in 12 counties with areas of oak wilt disease (from Brown to Austin Counties) would likely spread the disease to adjacent disease free areas unless controlled. Construction and/or the possibility of a pipeline leak or rupture during operation of the project has the potential of affecting four federally listed or proposed wildlife species: Attwater's greater prairie chicken, bald eagle, black-capped vireo, and Concho water snake, with an impact rating of 1 or 2. In addition, the Northern Alternative has the potential of significant impacts to 10 federal candidate or state-classified endangered or threatened animal species with an impact rating of 3. No federal or state-listed or proposed threatened or endangered plant species are known within or adjacent to the Northern Alternative ROW. Seven known locations of federal candidate and/or state sensitive (TNHP) plant populations occur within a 6-mile wide corridor along the route. In addition, nine TNHP natural communities occur within the corridor. Based on occurrence information provided by TNHP, it appears that eight of these locations potentially would be crossed by the route, a significant impact.

Cultural Resources

Six sites are known to exist within the 100-ft construction ROW for the Northern Alternative. Prehistoric site types include burned rock middens, miscellaneous burned rock features, quarries, and lithic scatters. Historic site types include cemeteries and artifact scatters. Past research in the general vicinity of the pipeline corridor suggests that site type variability is in fact greater than the inventory of known sites suggests.

There are very likely unrecorded sites in unsurveyed portions of the route, many of which may be significant. Significant direct impacts to both known and unrecorded cultural resources are certain to occur as a consequence of ground-disturbing activities associated with the construction phase.

Thirty-six sites are known to exist in the Northern Alternative corridor vicinity but exterior to the actual construction ROW. Significance data for these sites are largely unknown. The number of sites which actually exist within the 1-mile study corridor straddling the line is unknown. The potential for significant and long-term impacts of an indirect nature is quite high; however, it cannot be quantified without vastly increasing the cultural resource data base along the entire mile-wide corridor.

Abandonment activities are similar to those associated with construction in the sense that they involve surface and subsurface disturbance. However, all such activities should take place in areas previously disturbed during pipeline construction, and it is unlikely that previously undisturbed cultural sites would be subjected to significant direct impact.

Paleontology

Most impacts to paleontological resources would be incurred during the construction phase of the project, and are apt to occur within the construction ROW. Any ground-disturbing activities may adversely affect paleontological resources.

Significant impacts may occur where any of the units designated as high or medium sensitivity are crossed by the Northern Alternative. High sensitivity units crossed by the route are the Cook Mountain Formation (Burleson County vicinity) and the Oakville, Fleming, and Beaumont Formations (Gulf Coast portion of route). Medium sensitivity units are the Glen Rose and Fort Terrett Formations (McCamey-San Angelo vicinity), Eagle Ford Group (McLennan-Falls-Bell County vicinity), and Pleistocene Terraces. Terraces can occur at stream crossings anywhere along the route. Of particular concern are the crossings of the South Concho River, Pecan Creek, Colorado River, Leon River, Little River, East and Middle Yegua Creeks, West Fork Mill Creek, Tepee Draw, Middle and East Kickapoo Creeks, Panther Creek, Cowhouse Creek, Big Elm Creek, and Brazos River.

No known paleontological localities lie within the Northern Alternative construction ROW; therefore, it is not possible to assess specific impacts.

Operation and abandonment of the pipeline are unlikely to produce additional significant impacts to paleontological resources, particularly if activities are largely confined to the original construction ROW.

Air Quality and Meteorology

No significant impacts were identified for air resources.

Land Use and Recreation

There are no significant land use impacts under normal construction and operation procedures. Exotic and native game species could be significantly impacted on private game reserves if adequate fencing to protect these animals is not installed during construction activities. If an oil spill was to occur in a river, lake or estuary, many recreational resources and activities could be significantly impacted depending upon the location and severity of the spill. Table 4-32 describes these potentially impacted resources.

Socioeconomics

There are no negative socioeconomic impacts as a result of the Northern Alternative. Mills County would experience a 10 percent increase in the tax base due to pipeline construction and operation; this is a positive socioeconomic impact. If an oil spill was to occur, there could be impacts on municipal and rural water supplies which would constitute a socioeconomic impact.

Transportation

Transportation effects from development of the All American Pipeline on the Northern Alternative alignment would not be significant.

Visual Resources

There would be no significant adverse visual effects from construction, operation or abandonment of the All American Pipeline on the Northern Alternative alignment.

Noise

Construction of the All American Pipeline on the Northern Alternative alignment would generate noise in excess of the 65 dBA significance threshold at up to 750 homes, depending on individual site conditions. Although significant, these noise impacts would be limited to less sensitive daylight hours and would affect individual homes for only 2 to 3 weeks out of the 6-month construction period. The 65 dBA level would not be achievable by application of standard construction noise reduction measures, but more stringent mitigation measures would not be warranted because of the extremely short duration of the impact.

Operation of the pipeline in the Northern Alternative alignment could cause significant long-term noise in excess of 65 dBA at several residences near proposed sites for pump stations 4, 5, and 6, depending on specific site design features. Application of recommended Mitigation Measure N-1 would reduce operating noise impacts to non-significant levels at all noise sensitive receptors near pump station sites.

Abandonment of the pipeline in place would result in no significant noise effects. Salvage of the pipeline would result in a recurrence of noise impacts similar to those described for construction.

3.4.3 Impact Summary - Southern Alternative

System Safety and Reliability

An impact summary is not considered necessary for this discipline because it is not considered an environmental resource. This discipline describes the safety and reliability of the operation of the pipeline, which is important in defining the risks to environmental resources.

Groundwater

The 538-mile Southern Alternative from McCamey to Webster and Texas City crosses outcrops or recharge zones of three major and two minor aquifers. There are 418 miles along the route which cross sensitive aquifers.

From west to east, the Southern Alternative traverses the following sensitive aquifers: Edwards-Trinity Plateau, Carrizo-Wilcox, Queen City, Sparta, and Gulf Coast (refer to Tables 3-1 and 3-1a in the Modifications and Corrections section of the Final SEIS).

The Southern Alternative would cross 157 miles of the Edwards-Trinity Plateau Aquifer. Significant impacts to groundwater quality could occur in the event of oil spills or leaks during pipeline operation; and the areas of highest sensitivity to an oil spill on the Edwards Plateau are cities and towns with groundwater supplies and important springs discharging from this aquifer.

Although the entire Edwards-Trinity Plateau Aquifer is considered to be sensitive, there are local variations in aquifer conditions which limit the potential adverse effects of an oil spill in some areas and cause other areas to be highly sensitive. Occurrence of an oil spill in an unfractured area or where fractures are filled with marl or soil would most likely be cleaned up at the surface before a significant volume of oil could infiltrate to depth. If a spill occurred and entered a zone of open fractures or solution channels, then oil could migrate relatively rapidly through these zones.

The aquifer along the Southern Alternative is generally confined and is not a recharge area. Therefore, sources of several springs and water supplies would not be affected by potential oil spills. However, springs which discharge from alluvial gravels fed by underlying artesian aquifers, such as Leona Springs and Soldiers Camp Springs, could be impacted.

The Carrizo-Wilcox Aquifer intersects the Southern Alternative near San Antonio. The shallow depth to groundwater and high degree of groundwater use for municipal, domestic, and other purposes combine to make this aquifer sensitive to potential oil spill impacts. Impacts would be limited to the aquifer recharge area because oil would not migrate downdip into the confined portions of the aquifer.

Subsurface oil spill migration and behavior in the granular aquifer is more predictable and more easily mitigated than in fractured limestone aquifers. Therefore, a smaller area is likely to be affected during the time between a spill event and implementation of cleanup measures. Please refer to Modifications and Corrections Section 3.3 for Appendix A Sections 1.1 through 1.4 for detailed discussions on crude oil properties and behavior. Section 1.5 of the same appendix discusses threshold spill sizes for aquifer pollution based on health criteria as well as taste and odor criteria.

The Southern Alternative avoids the highly sensitive Edwards Balcones Fault Zone Aquifer recharge area by trending southeast across the Edwards Plateau through Kinney County and Brackettville, then heading east. The Balcones Fault Zone Aquifer feeds springs and municipal water supplies in Brackettville and Uvalde. In these towns, the aquifer occurs at depth under relatively low permeability confining layers. The aquifer discharges in this area through natural faults as springs and by withdrawal from wells. The route crosses the limestones of the Edwards Plateau approximately 12 miles northwest of Brackettville.

The municipalities of Ozona, Brackettville, Uvalde, Devine, Natalia, Floresville, Cuero, Wharton, Needville, and Alvin rely on water supplies within two miles of the route, have populations of over 1,000, and use groundwater as their primary source of drinking water. The towns of Brackettville, Uvalde, Devine, and Natalia each obtain groundwater from the downdip portion of the Edwards Balcones Fault Zone Aquifer; however, this portion of the aquifer is not sensitive to potential contamination from the surface because of overlying confining layers of low permeability. There are also numerous smaller towns, ranches, homes, and agricultural wells located along the Southern Alternative which similarly depend upon groundwater supplies: Table 3-3 in the Modifications and Corrections section of the Final SEIS lists ten springs which lie between 0.25 to 23 miles of the Southern Alternative.

The probability of an oil spill is calculated to be 6.7 spills over a 40-year pipeline life within any sensitive aquifer along the Proposed Route (4.017×10^{-4} spills per mile-year x 418 miles x 40 years). The average spill size for the All American Pipeline has been estimated as 3,750 barrels.

Considering the historically low incidence of groundwater contamination resulting from reported oil spills and the response measures included in the Oil Spill Contingency Plan, not all of the predicted oil spills would result in significant impacts. There is, however, a small probability that significant impacts to groundwater quality could occur during the operational life of the project. Impacts would probably be of limited extent (i.e., <<2 miles downgradient) and duration (i.e., several months to years). Under some conditions (e.g., fissured limestone aquifers with rapid recharge) the extent of contamination by dissolved crude oil constituents may be greater; however, the duration of impacts could be much shorter.

Surface Water

The Southern Alternative crosses 115 named drainages of which 15 are perennial and 100 are intermittent. There would be no significant impacts to these water bodies during construction. A major oil spill or leak would degrade water quality below federal and state standards and affect downstream users. These would represent potential significant impacts to the major crossings. Other values of the water bodies (e.g. aquatic biology, recreation) are discussed in these disciplines. Eighteen of the crossings are considered major for surface water resources (Table 4-53). The Southern Alternative crosses nine streams which are municipal water supplies. The streams crossed are Devil's, Nueces, Leona, Frio, Sabinal, Hondo, Lavaca, Navidal, and Brazos. The towns and municipalities possibly impacted by an oil spill are Rio Diablo Development Company, Three Rivers, Corpus Christi, and Freeport. The Southern Alternative is upstream of four reservoirs: Amistad, Upper Nueces, Choke Canyon, and Lake Texana.

Geology

Construction of the pipeline following the Southern Alternative would produce impacts similar to those described for the Proposed Route, with differences noted below. No unique geologic features occur along this alternative. The Southern Alternative crosses the Edwards Plateau in an area which is more deeply dissected and which has steeper slopes than the area traversed by the Proposed Route. Construction logistical problems would be expected in the deeply dissected southern Edwards Plateau region. These problems could reduce the engineering feasibility of the alternative. Caves and karst features encountered during route surveying or clearing may necessitate local realignment of the route.

Most impacts due to pipeline operations along the Southern Alternative would be similar to those described for the Proposed Route. Both routes coincide in the Houston area, so the potential impacts caused by subsidence-induced surface faulting are the same.

Potentially unstable banks can be found at several stream crossings. These crossings occur at the Devil's River, Dry Devil's River, Frio River, Sabinal River, Guadalupe River, Colorado River, West Bernard Creek, San Bernard River, and Brazos River. The number of suboptimal stream crossings could be reduced by slight refinements to the route so that it intersects rivers at straight reaches where bank erosion is minimal.

The Southern Alternative passes near two areas of karstic limestone identified by Kier et al. (1977). The potential for adverse impacts in this karst area is not significant. Karst in the Edwards Plateau has generally been found to be inactive or of a small scale (Rose 1972) that would not significantly impact the pipeline.

Soils

No significant impacts to soil resources would occur with the implementation of sound mechanical erosion control and revegetation

techniques. Impacts to soils resulting from oil pipeline leaks and ruptures would not be significant since the relatively small areas affected would be rehabilitated by AAPL within a two-year period.

Aquatic Biology

Of the 115 streams that would be crossed by the Southern Alternative, 20 contain important fish populations. These include Pinto Creek, Devil's River, Las Moras Creek, Nueces River, Hondo Creek, Sabinal River, Frio River, Cibolo Creek, San Antonio Creek, San Antonio River, Guadalupe River, Lavaca River, Navidad River, Colorado River, San Bernard River, Brazos River, Oyster Creek, Chocolate Bayou, Mustang Bayou, Highland Bayou, and Clear Creek. Twenty-four important fish species or species groups occur in these rivers. Except for Chocolate Bayou, Mustang Bayou, Las Moras Creek, and Pinto Creek, the rivers are known to contain moderate to large numbers of important species (i.e., greater than six species or species groups). Four reservoirs (Amistad, Upper Nueces, Choke Canyon, and Lake Texana) also are located downstream of the Southern Alternative. The number of important fish species in these reservoirs range from eight in Choke Canyon to 14 in Amistad Reservior. Four estuaries or coastal areas (Galveston Bay system, Gulf of Mexico near Freeport and Surfside, Matagorda Bay, and San Antonio Bay) could be affected by the Southern Alternative if an oil spill reaches the coast.

Significant impacts could occur if a lubricant or fuel spill reached important water bodies or blasting occurred in important streams during construction. Significant impacts would occur during operation if an oil spill entered the streams, reservoirs, or coastal areas. Important fish populations that could be affected include both game fish and threatened and endangered species in freshwater environments and finfish, shrimp, crab, and oysters in the marine environments (Tables 4-18 and 4-57). No federally listed threatened or endangered species are known to occur in streams potentially affected by this route. Eight federal candidate or state-listed fish species could be affected by an oil spill (Table 3-62). Six species (proserpine shiner, Devil's River minnow, Rio Grande darter, Guadalupe bass, Concho pupfish, and blotched gambusia) occur in the Devil's River drainage. Guadalupe bass, blue sucker, and greenthroat darter occur in other rivers, as listed in Table 3-62.

Terrestrial Biology

Implementation of the Southern Alternative would disturb a total of 6,518 acres along the 538-mile route. Approximately 773 acres (64 miles) of this disturbance at the western end of the alternative have been previously cleared along the pipeline ROW. The majority of the disturbance along the entire route would affect oak-mesquite-juniper habitat and agricultural lands. Construction impacts to riparian communities would involve about 260 acres and would be considered a significant impact. Construction activities in eight counties with areas of oak wilt disease (from Uvalde to Lavaca Counties) would likely spread the disease to adjacent disease free areas unless controlled. Construction and/or the possibility of a pipline leak or rupture during

operation of the project has the potential of affecting two federally listed or proposed wildlife species: bald eagle and black-capped vireo, with an impact rating of 1 or 2. In addition, the Southern Alternative has the potential of significant impacts to 17 federal candidate or state-classified endangered or threatened animal species with an impact rating of 3. No federal or state-listed or proposed threatened or endangered plant species are known to occur within or adjacent to the Southern Alternative ROW. Eleven known locations of federal candidate and/or state sensitive (TNHP) plant populations occur within a six-mile wide corridor along the route. In addition, one TNHP natural community occurs within the corridor. Based on occurrence information provided by TNHP, it appears that five of these locations potentially would be crossed by the route, a significant impact.

Cultural Resources

Thirty-five sites are known to exist within the 100-ft construction ROW for the Southern Alternative. Most prehistoric sites are lithic scatters. Historic site types include intact structures and cemeteries. Past research in the general vicinity of the pipeline corridor suggests that site type variability is in fact greater than the inventory of known sites suggests, and minimally includes burned rock middens and other buried rock features, lithic sites, standing structures and structural remains, wells/cisterns, cemeteries, dumps, and historic artifact scatters.

Not all sites have been evaluated for National Register eligibility. Any sites shovel tested during Texas A&M University's portial survey of the All American Pipeline route cannot be regarded as having been evaluated for significance, since testing was conducted mainly for the purpose of establishing horizontal site limits and did not exceed 50 cm in depth (Mueller-Wille 1986). In addition to the inventory of recorded sites, there are unrecorded sites in unsurveyed portions of the route, many of which may be significant. Significant direct impacts to both known and unrecorded cultural resources are certain to occur as a consequence of ground-disturbing activities associated with the construction phase.

Twenty-eight sites are known to exist in the Southern Alternative corridor vicinity but exterior to the actual construction ROW. Significance data for these sites are largely unknown. The number of sites which actually exist within the 1-mile study corridor straddling the line is unknown. The potential for significant and long-term impacts of an indirect nature is quite high; however, it cannot be quantified without vastly increasing the cultural resource data base along the entire mile-wide corridor.

Abandonment activities are similar to those associated with construction in the sense that they involve surface and subsurface disturbance. However, all such activities should take place in areas previously disturbed during pipeline construction, and it is unlikely that previously undisturbed cultural sites would be subjected to significant direct impact.

Paleontology

Most impacts to paleontological resources would be incurred during the construction phase of the project, and are apt to occur within the construction ROW. Any ground-disturbing activities may adversely affect paleontological resources.

Significant impacts may occur where any of the units designated as high or medium sensitivity are crossed by the Southern Alternative. High sensitivity units crossed by the route are the Cook Mountain and Oakville Formations (DeWitt County vicinity), Fleming Formation (DeWitt-Lavaca County vicinity), Goliad Formation (central and eastern sectors of the route), and Beaumont Formation (Gulf Coast portion of the route). Medium sensitivity units are the caves on the Edwards Plateau and Pleistocene Terraces. Terraces can occur at stream crossings anywhere along the route. Of particular concern are the crossings of the Nueces River, Leona River, Cooks Slough, Frio River, Sabinal River, Hondo Creek, San Francisco Perez Creek, Chacon Creek, San Antonio River, Cibolo Creek, Guadalupe River, East Fork Sycamore Creek, Flat Rock Creek, Sandy Creek, Lavaca River, and Navidad River.

Both of the known paleontological localities along the Southern Alternative are in Edwards Plateau caves, rated generally as being of medium sensitivity. In fact, these caves (Deep and Blowhole) have produced limited fossil assemblages and are important mainly in the potential they demonstrate for other sites in similar contexts. They are not likely to be adversely affected by pipeline construction, and the threat of significant impact is small.

Operation and abandonment of the pipeline are unlikely to produce additional significant impacts to paleontological resources, particularly if activities are largely confined to the original construction ROW.

Air Quality and Meteorology

No significant impacts were identified for air resources.

Land Use and Recreation

There are no significant land use impacts under normal construction and operation procedures. Exotic and native game species could be significantly impacted on private game reserves if adequate fencing to protect these animals is not installed during construction activities. If an oil spill was to occur in a river, lake, or estuary, many recreational resources and activities could be significantly impacted depending upon the location and severity of the spill. Table 4-32 describes these potentially impacted resources.

Socioeconomics

There are no negative socioeconomic impacts as a result of the Southern Alternvative. Kinney County would experience a 12.3 percent increase in the tax base due to pipeline construction and operation;

this is a positive socioeconomic impact. If an oil spill was to occur, there could be impacts on municipal and rural water supplies which would constitute a socioeconomic impact.

Transportation

Transportation effects from development of the All American Pipeline on the Southern Alternative alignment would not be significant.

Visual Resources

There would be no significant adverse visual effects from construction, operation or abandonment of the All American Pipeline on the Southern Alternative alignment.

Noise

Construction of the All American Pipeline on the Southern Alternative alignment would generate noise in excess of the 65 dBA significance threshold at up to 1,300 homes, depending on individual site conditions. Although significant, these noise impacts would be limited to less sensitive daylight hours and would affect individual homes for only 2 to 3 weeks out of the 6-month construction period. The 65 dBA level would not be achievable by application of standard construction noise reduction measures, but more stringent mitigation measures would not be warranted because of the extremely short duration of the impact.

Operation of the pipeline in the Southern Alternative alignment could cause significant long-term noise in excess of 65 dBA at several residences near proposed sites for pump stations 4 and 6, depending on specific site design features. Application of recommended Mitigation Measure N-1 would reduce operating noise impacts to non-significant levels at all noise sensitive receptors near pump station sites.

Abandonment of the pipeline in place would result in no significant noise effects. Salvage of the pipeline would result in a recurrence of noise impacts similar to those described for construction.

APPENDIX A -
MITIGATION MEASURES

APPENDIX A

MITIGATION MEASURES

Part 5 of the Settlement Agreement (Civil Action No. A-86-CA-141, in the United States District Court for the Western District of Texas, Austin Division) entered into by BLM, the State of Texas, and the All American Pipeline Company states that "All American agrees that its construction east of McCamey will incorporate any mitigation measures or other amendments, modifications, or clarifications whether embodied in an amended record of decision or an amended Right-of-Way grant." The agreement further states that "BLM is vested with remedial powers concerning any construction in violation of its permits, including the discretion to revoke the Right-of-Way Grant for the entire route over federal lands from California to the Houston area."

The mitigations BLM specifies in its amended Record of Decision will be derived from the measures proposed in this Supplemental EIS. Those measures are presented on the following pages. BLM recognizes that all lands crossed in Texas between McCamey and the Gulf Coast are under private ownership. Landowner concerns will be a primary consideration of the Bureau in determining whether and how to require mitigation.

To ensure that these measures are implemented properly, BLM will utilize a compliance team to monitor construction. The Chief of BLM's California Desert District Pipeline Project Office has been designated BLM's Authorized Officer for the AAPL project, and will serve as compliance team leader. The team, composed of BLM staff and assisted by the staffs of other interested agencies, will oversee construction of the pipeline. The BLM staff will be headquartered in BLM's Desert District Office in Riverside, California. Inspectors will accompany construction spreads on-the-ground in Texas.

Construction will not proceed until the Authorized Officer issues a Notice to Proceed (NTP) for a given stretch of the pipeline (which typically could range from 50 to 150 miles). BLM will not issue an NTP until all applicable mitigation measures have been implemented. In addition, BLM could halt construction (through the issuance of a Stop Work order) should a situation arise where the Authorized Officer felt this was necessary. These procedures will be followed subject to the desires of the private landowner.

The following discussion describes each of the measures now being considered for inclusion in the amended Record of Decision. The anticipated effectiveness of the measure is indicated, as well as the conditions under which it would be applied. Following this discussion, Tables 4-63, 4-64, and 4-65 tabulate the significant impacts which are being mitigated, and the effectiveness of the measures in reducing the impacts.

4.7.1 System Safety and Reliability

Measure SS-1: A draft Oil Spill Contingency Plan (OSCP) will be developed and submitted to the BLM for review and approval six months before the proposed operation of the pipeline. The plan will contain site-specific measures for major river crossings and other areas identified by the Authorized Officer. A preliminary list of locations for which site-specific information will be included in the plan is provided in Table 4-61c. A final OSCP will be prepared prior to operation. A preliminary plan has been prepared to provide the framework for the final plan and to identify potential containment and cleanup procedures. Appendix B of the Draft SEIS contains the preliminary OSCP. Revisions are included in the Modifications and Corrections section for Appendix B.

Effectiveness: The Department of Transportation has found OSCPs to be critical to successful oil spill mitigation plans and thus requires preparation and approval of these plans prior to operation of the pipeline. The plan identifies responsible parties, action plans, equipment, logistics, including response times, sensitive resources at risk, and other items necessary for effective oil spill containment and cleanup.

Application: The plan includes general procedures for various types of spill scenarios and specific procedures for sensitive areas. The plan focuses on rivers, lakes, bayous, and other vulnerable water bodies. Where block valve closure and oil spill response times have been judged to be inadequate, Mitigation Measure SS-2, which specifies remote-control block valves, has been required in order to reduce potential oil spill volumes. The BLM Authorized Officer will require, as part of Mitigation Measure SS-1, that the Emergency Response Team be able to respond to an oil spill at any sensitive location identified in Table 4-61c within approximately 1-hour of notification. Where this is not feasible, trained local responders and local storage of equipment will be required.

Measure SS-2: Installation of remote-control block valves and automatic check valves are required at specific locations to reduce oil spill volumes should a pipeline rupture occur.

Effectiveness: In the event of a leak, the remote-control block valves and automatic check valves will reduce emergency closure time of segments of the pipeline from approximately 1 hour or more to about 6 minutes.

Application: Remote-control block valves will be installed at locations of sensitive resources that would be significantly impacted if an uncontrolled spill were to occur. The locations are listed in Table 4-62. AAPL estimates costs to add remote actuation valves to be between $25,000 and $120,000 per valve. The cost to add remote actuation to an existing block valve and check valve is about $25,000; to add remote actuation to an existing block valve and to add a check valve where one is not present is about $53,000; and to add a remote

TABLE 4-61c

LOCATION OF SITE-SPECIFIC OIL SPILL CONTIGENCY PLANS

Proposed Route Location	Description of Resource at Risk	Resource Location
All resource locations with proposed remote-control block valves listed in Revised Table 4-62 will contain a site-specific Oil Spill Contigency Plan. Additional sites are listed below.		
Ozona municipal water supply	Groundwater resources	Within two miles of route
Sonora municipal water supply	Groundwater resources	Within two miles of route
Caverns of Sonora	Subterranean caverns	One mile south of route (See Map 2-2, sheet 2)
Kyle municipal water supply	Groundwater resources	Within two miles of route
Fredericksburg municipal water supply	Groundwater resources	Within two miles of route
Springlake and San Marcos River	Edwards Aquifer recharge zone; special status aquatic wildlife and plant species	Twelve miles from route (See Map 2-2, sheet 5)
Comal Springs	Special status fish species	Twenty miles south of route (See Map 2-2, sheet 5)
Weimer municipal water supply	Groundwater resources	Within two miles of route
Eagle Lake municipal water supply	Groundwater resources	Within two miles of route
East Bernard municipal water supply	Groundwater resources	Within two miles of route
Rosenburg municipal water supply	Groundwater resources	Within two miles of route
Bald eagle feeding and nesting sites	Bald eagle-federally endangered	Two areas: one southeast of Worthington Lake, another along the Brazos River. (See Map 2-2, sheet 8)
Mustang Bayou	Game fish species; Gulf Coast recreational resources	See Map 2-2, sheet 8
Clear Creek	Game fish species; Gulf Coast recreational resources	See Map 2-2, sheet 8
Alvin municipal water supply	Groundwater resources	Within two miles of route

Site-specific Oil Spill Contigency Plans will be prepared for coastal bays, estuaries, beaches, and refuges potentially impacted by an oil spill along an inland waterway. Applicable water crossings were addressed in Table 4-62, with additional sites listed above.

TABLE 4-61c (CONTINUED)

Northern Alternative Location	Description of Resource at Risk	Resource Location
All resource locations with proposed remote-control block valves listed in Revised Table 4-62 will contain a site-specific Oil Spill Contigency Plan. Additional sites are listed below.		
Rankin municipal water supply	Groundwater resources	Within two miles of route
Big Lake municipal water supply	Groundwater resources	Within two miles of route
Dove Creek	Special status and game fish species	See Map 2-3, sheet 2
McGregor municipal water supply	Groundwater resources	Within two miles of route
Big Elm Creek	Game fish species (similar to those of the Brazos River)	Entire perennial section of stream
Rockdale municipal water supply	Groundwater resources	Within two miles of route
Plum Creek, San Bernard River, and Attwater Greater Prairie Chicken National Wildlife Refuge	Houston toad and Attwater greater prairie chicken-federally endangered	South of route from intermittent Plum Creek to the San Bernard River intersecting the NWR.
Sealy municipal water supply	Groundwater resources	Within two miles of route
Wallis municipal water supply	Groundwater resources	Within two miles of route
Rabbs Bayou	Game fish species, bald eagle	Within entire stream
Rosenburg municipal water supply	Groundwater resources	Within two miles of route
Bald eagle feeding and nesting sites	Bald eagle-federally endangered	Two areas: one southeast of Worthington Lake, another along the Brazos River (See Map 2-3, sheet 9)
Mustang Bayou	Game fish species; Gulf Coast recreational resources	See Map 2-3, sheet 9
Clear Creek	Game fish species; Gulf Coast recreational resources	See Map 2-3, sheet 9
Alvin municipal water supply	Groundwater resources	Within two miles of route

Site-specific Oil Spill Contigency Plans will be prepared for coastal bays, estuaries, beaches, and refuges, potentially impacted by an oil spill along an inland waterway. Applicable water crossings were addressed in Table 4-62, with additional sites listed above.

TABLE 4-61c (CONTINUED)

Southern Alternative Location	Description of Resource at Risk	Resource Location
All resource locations with proposed remote-control block valves listed in Revised Table 4-62 will contain a site-specific Oil Spill Contigency Plan. Additional sites are listed below.		
Ozona municipal water supply	Groundwater resources	Within two miles of route
Pinto Creek	Special status fish species	See Map 2-4, sheet 3
Los Moras Creek	Special status and game fish species	See map 2-4, sheets 3 and 4
Bracketville municipal water supply	Groundwater resources	Within two miles of route
Leona River	Three Rivers municipal water supply, via Frio River; Choke Canyon recreational resources	See Maps 2-4, sheet 4
Uvalde municipal water supply	Groundwater resources	Within two miles of route
Hondo Creek	Three Rivers municipal water supply, via Frio River; Choke Canyon recreational resources	See Map 2-4, sheet 4
Devine municipal water supply	Groundwater resources	Within two miles of route
Natalia municipal water supply	Groundwater resources	Within two miles of route
Floresville municipal water supply	Groundwater resources	Within two miles of route
Cibolo Creek	Special status and game fish species; Gulf Coast recreational resources	See Map 2-4, sheet 6
Cuero municipal water supply	Groundwater resources	Within two miles of route
Wharton municipal water supply	Groundwater resources	Within two miles of route
Needville municipal water supply	Groundwater resources	Within two miles of route
Bald eagle feeding and nesting sites	Bald eagle-federally endangered	Two areas: one southeast of Worthington Lake, another along the Brazos River (See Map 2-4, sheet 9)
Mustang Bayou	Game fish species; Gulf Coast recreational resources	See Map 2-4, sheet 9
Clear Creek	Game fish species; Gulf Coast recreational resources	See Map 2-4, sheet 9
Alvin municipal water supply	Groundwater resources	Within two miles of route

Site-specific Oil Spill Contigency Plans will be prepared for coastal bays, estuaries, beaches, and refuges, potentially impacted by an oil spill along an inland waterway. Applicable water crossings were addressed in Table 4-62, with additional sites listed above.

REVISED TABLE 4-62

LOCATIONS OF PROPOSED REMOTE-CONTROL BLOCK VALVES FOR POTENTIAL OIL SPILL REDUCTIONS

Location and Downstream Area	Additional Block Valve and Check Valve Required	Remote-Control	Estimate of Oil Volume Lost (1,000 Barrels)[1] With Remote-Control Valves 12 in. Break	With Remote-Control Valves 30 in. Break	With Manual Valves 12 in. Break	With Manual Valves 30 in. Break	Important Resources[2]
Proposed Route							
South Llano River Lake Lyndon B. Johnson (150 mi)[3] See Map 2-2, Sheet 3	No	Yes	2.9	3.8	NA	NA	8 game fish species; 1 special status fish species (Table 4-15) - Junction (12 mi), Llano (70 mi), and Llano Municipal Water District (150 mi) municipal water supplies (Revised Table 4-12) -Lake Lyndon B. Johnson recreational resources (Revised Table 4-32)
Pedernales River Lake Travis (100 mi) See Map 2-2, Sheet 4	No	Yes	1.6	2.2	11.2	15.2	8 game fish species (Table 4-15) -Johnson City municipal water supply (40 mi) (Revised Table 4-12) - Lake Travis recreational resources (Revised Table 4-32)
Colorado River Gulf Coast (106 mi) See Map 2-2, Sheet 7	No	Yes	2.0	2.9	7.6	17.4	14 game fish species; 2 special status fish species (Table 4-15) - Downstream water users - Gulf Coast recreational resources (Revised Table 4-32)
San Bernard River Gulf Coast (80 mi) See map 2-2, Sheet 7	No	Yes	1.6	2.2	4.4	8.0	8 game fish species (Table 4-15) - Downstream water users - Gulf Coast recreational resources (Revised Table 4-32)
Brazos River Gulf Coast (57 mi) See Map 2-2, Sheet 8	No	Yes	2.0	2.6	3.7	7.6	15 game fish species; 1 special status fish species (Table 4-15) - bald eagle, sensitive bay species - Freeport municipal water supply (Revised Table 4-12) - Gulf Coast recreational resources (Revised Table 4-32)
Highland Bayou Gulf Coast (6 mi) See Map 2-2, Sheet 8	Yes	Yes	1.6	2.2	3.6	4.2	6 game fish species; coastal fisheries (Table 4-15) - bald eagle, waterfowl, water birds, special status bay species - Gulf Coast recreational resources (Revised Table 4-32)
Chocolate Bayou Gulf Coast (18 mi) See Map 2-2, Sheet 8	Yes	No	NA	NA	NA	NA	1 game fish species; coastal fisheries (Table 4-15) - waterfowl, waterbirds, sensitive bay species -Gulf Coast recreational resources (Revised Table 4-32)
Oyster Creek Gulf Coast (61 mi) See Map 2-2, Sheet 8	Yes	No	NA	NA	NA	NA	4 game fish species (Table 4-15) - waterfowl, waterbirds, sensitive bay species - Gulf Coast recreational resources (Revised Table 4-32)

REVISED TABLE 4-62 (CONTINUED)

Location and Downstream Area	Additional Block Valve and Check Valve Required	Remote-Control	Estimate of Oil Volume Lost (1,000 Barrels)[1] With Remote-Control Valves 12 in. Break	With Remote-Control Valves 30 in. Break	With Manual Valves 12 in. Break	With Manual Valves 30 in. Break	Important Resources[2]
Northern Alternative							
South Concho River Twin Buttes Reservoir (1 mi) See Map 2-3, Sheet 2	Move to Correct Location	Yes	2.1	2.5	38.1	64.0	5 game fish species; 1 state special status fish species (Table 4-45) - Concho water snake - San Angelo municipal water supply (16 mi) (Revised Table 4-12) - Twin Buttes Reservoir recreational resources (Revised Table 4-32)
Colorado River Lake Buchanan (130 mi) See Map 2-3, Sheet 3	No	Yes	1.6	2.2	29.4	36.4	14 game fish species; 2 special status fish species (Table 4-45) - Concho water snake - Goldthwaite (80 mi) and Lower Colorado River Authority municipal water (130 mi) supplies (Revised Table 4-12) - Lake Buchanan recreational resources (Revised Table 4-32)
Pecan Bayou Lake Buchanan via Colorado River (150 mi) See Map 2-3, Sheet 4	Move to Correct Location	Yes	1.6	2.2	15.3	18.7	4 game fish species; 1 special status fish species (Table 4-45) - Goldthwaite municipal water supply (150 mi) (Revised Table 4-12) - Lake Buchanan and Colorado River recreational resources (Revised Table 4-32)
Leon River Belton Reservoir (30 mi) See Map 2-3, Sheet 5	Move to Correct Location	Yes	1.6	2.2	11.3	21.0	9 game fish species (Table 4-45) - McGregor and Gatesville municipal water supplies (50 mi) (Revised Table 4-12) - Belton Reservoir recreational resources (Revised Table 4-32)
Lampasas River Stillhouse Hollow Reservoir (75 mi) See Map 2-3, Sheet 5	Move to Correct Location	No[4]	1.6	2.2	9.9	12.5	9 game fish species (Table 4-45) - Cedar Park Water Supply Corp. municipal water supply (75 mi) (Revised Table 4-12) - Stillhouse Hollow Reservoir recreational resources (Revised Table 4-32)
South Bosque River Waco Lake (10 mi) See Map 2-3, Sheet 6	No	Yes	1.8	2.7	11.6	38.4	1 special status fish species (Table 4-45) - Waco municipal water supply (10 mi) (Revised Table 4-12) - Waco Lake recreational resources (Revised Table 4-32)
Little River Cameron Reservoir (7 mi) See Map 2-3, Sheet 6	No	Yes	1.6	2.2	8.0	16.0	8 game fish species (Table 4-45) - Cameron municipal water supply (7 mi) (Revised Table 4-12) - Cameron City recreational resources (Revised Table 4-32)
Middle & East Yegua Creeks Lake Somerville (8 mi) See Map 2-3, Sheet 7	No	Yes	1.6	2.2	3.9	6.0	1 endangered fish species (Table 4-45) - Brenham municipal water supply (12 mi) (Revised Table 4-12) - Somerville Lake recreational resources (Revsied Table 4-32)

REVISED TABLE 4-62 (CONTINUED)

Location and Downstream Area	Additional Block Valve and Check Valve Required	Remote-Control	Estimate of Oil Volume Lost (1,000 Barrels)[1] With Remote-Control Valves 12 in. Break	With Remote-Control Valves 30 in. Break	With Manual Valves 12 in. Break	With Manual Valves 30 in. Break	Important Resources[2]
Northern Alternative (Continued)							
Brazos River Gulf Coast (57 mi) See Map 2-3, Sheet 9	No	Yes	2.0	2.6	3.7	7.6	15 game fish species; 1 special status fish species (Table 4-45) - bald eagle, sensitive bay species - Freeport municipal water supply (Revised Table 4-12) - Gulf Coast recreational resources (Revised Table 4-32)
Highland Bayou Gulf Coast (6 mi) See Map 2-3, Sheet 9	Yes	Yes	1.6	2.2	3.6	4.2	6 game fish species; coastal fisheries (Table 4-45) - bald eagle, waterfowl, waterbirds, sensitive bay species - Gulf Coast recreational resources (Revised Table 4-32)
Chocolate Bayou Gulf Coast (18 mi) See Map 2-3, Sheet 9	Yes	No	NA	NA	NA	NA	1 game fish species; coastal fisheries (Table 4-45) - waterfowl, waterbirds, sensitive bay species - Gulf Coast recreational resources (Revised Table 4-32)
Oyster Creek Gulf Coast (61 mi) See Map 2-3, Sheet 9	Yes	No	NA	NA	NA	NA	4 game fish species; coastal fisheries (Table 4-45) - waterfowl, waterbirds, sensitive bay species - Gulf Coast recreational resources (Revised Table 4-32)

REVISED TABLE 4-62 (CONTINUED)

Location and Downstream Area	Additional Block Valve and Check Valve Required	Remote-Control	Estimate of Oil Volume Lost (1,000 Barrels)[1] With Remote-Control Valves 12 in. Break	With Remote-Control Valves 30 in. Break	With Manual Valves 12 in. Break	With Manual Valves 30 in. Break	Important Resources[2]
Southern Alternative							
Devil's River Amistad Reservoir (64 mi) See Map 2-4, Sheet 2	Yes	Yes	2.0	2.6	34.4	87.2	3 game fish species; 5 state special status fish species (Table 4-57) - Rio Diablo Development Company municipal water supply (64 mi) (Revised Table 4-12) - Amistad Reservoir recreational resources (Revised Table 4-32)
Nueces River Upper Nueces Reservoir (30 mi) See Map 2-4, Sheet 4	No	Yes	1.6	2.2	17.8	26.9	6 game fish species (Table 4-57) - Irrigation use (40 mi) (Revised Table 4-12) - Upper Nueces Reservoir recreational resources (Revised Table 4-32)
Sabinal River Choke Canyon Reservoir via Frio River (108 mi) See Map 2-4, Sheet 4	Yes	Yes	1.6	2.2	12.6	18.0	8 game fish species (Table 4-57) - Three Rivers municipal water supply (108 mi) (Revised Table 4-12) - Choke Canyon Reservoir recreational resources (Revised Table 4-32)
Frio River Choke Canyon Reservoir (100 mi) See Map 2-4, Sheet 4	No	Yes	1.6	2.2	13.5	16.8	8 game fish species (Table 4-57) - Three Rivers municipal water supply (Revised Table 4-12) - Choke Canyon Reservoir recreational resources (Revised Table 4-32)
San Antonio River Gulf Coast (132 mi) See Map 2-4, Sheet 6	No	Yes	1.6	2.2	6.5	8.4	5 game fish species; 1 special status fish species (Table 4-57) - Downstream water users - San Antonio River recreational resources (Revised Table 4-32)
Guadalupe River Gulf Coast (60 mi) See Map 2-4, Sheet 7	No	Yes	1.6	2.2	8.1	17.7	7 game fish species; 2 state special status fish (Table 4-57) - Guadalupe River recreational resources (Revised Table 4-32)
Lavaca River Lake Texana (25 mi) See Map 2-4, Sheet 7	No	Yes	1.6	2.2	9.9	20.6	12 game fish species; 1 special status fish species (Table 4-57) - Corpus Christi municipal water supply (25 mi) (Revised Table 4-12) - Lake Texana recreational resources (Revised Table 4-32)
Navidad River Lake Texana (25 mi) See Map 2-4, Sheet 7	No	Yes	1.6	2.2	5.8	9.8	12 game fish species; 1 special status fish species (Table 4-57) - Corpus Christi municipal water supply (25 mi) (Revised Table 4-12) - Lake Texana recreational resources (Revised Table 4-32)
Colorado River Gulf Coast (48 mi) See Map 2-4, Sheet 8	No	Yes	1.6	2.2	2.9	5.7	14 game fish species; 2 special status fish species (Table 4-57) - bald eagle - Gulf Coast recreational resources (Revised Table 4-32)
San Bernard River Gulf Coast (80 mi) See Map 2-4, Sheet 8	No	Yes	1.6	2.2	2.2	3.8	6 game fish species; 2 special status fish species (Table 4-57) - Gulf Coast recreational resources (Revised Table 4-32)

REVISED TABLE 4-62 (CONTINUED)

Location and Downstream Area	Additional Block Valve and Check Valve Required	Remote-Control	Estimate of Oil Volume Lost (1,000 Barrels)[1] With Remote-Control Valves 12 in. Break	With Remote-Control Valves 30 in. Break	With Manual Valves 12 in. Break	With Manual Valves 30 in. Break	Important Resources
Southern Alternative (Continued)							
Brazos River Gulf Coast (57 mi) See Map 2-4, Sheet 9	No	Yes	1.6	2.2	2.0	3.2	15 game fish species; 3 special status fish species (Table 4-57) - bald eagle, waterfowl, waterbirds - Freeport municipal water supply (Revised Table 4-12) - Gulf Coast recreational resources (Revised Table 4-32)
Highland Bayou Gulf Coast (6 mi) See Map 2-4, Sheet 9	Yes	Yes	1.6	2.2	3.6	4.2	6 game fish species; coastal fisheries (Table 4-57) - waterfowl, waterbirds - Gulf Coast recreational resources (Revised Table 4-12)
Chocolate Bayou Gulf Coast (18 mi) See Map 2-4, Sheet 9	Yes	No	NA	NA	NA	NA	1 game fish species; coastal fisheries (Table 4-57) - waterfowl, waterbirds, special status bay species - Gulf Coast recreational resources (Revised Table 4-32)
Oyster Creek Gulf Coast (61 mi) See Map 2.4, Sheet 9	Yes	No	NA	NA	NA	NA	4 game fish species; coastal fisheries (Table 4-57) - waterfowl, waterbirds, special status bay species - Gulf Coast recreational resources (Revised Table 4-32)

NA = Volumes not available.

[1]Estimates by Marmac based on the following assumptions:
a. Flow rate at time of break is 300,000 BPD.
b. Break is at low point in river crossing and all oil between valves will drain out.
c. Except for the spacing of the valves on the river crossings on the Proposed Route, all other valve spacings at river crossings are assumed to be 0.3 mile, since sufficient information is not available to determine valve spacing.

[2]Dstances from crossing to downstream reservoir or coastal area are provided in Column 1. Additional distances to downstream water users are provided in the column below.

[3]Miles downstream from proposed pipeline crossing.

[4]The Lampasas River is intermittent and is not rated by the USFWS; the nearest downstream reservoir (Stillhouse Hollow) is 75 mi downstream of the pipeline crossing. Therefore, a manual valve is proposed for this crossing.

NA = Volumes not available.

actuated block valve and check valve is about $97,000. The estimated cost of bringing in distribution voltage power (overhead) and communication is about $17,000.

Measure SS-3: A comprehensive safety review of pipeline design has yet to be completed because all of the final design information is not available for the Texas segment of the pipeline. In order to confirm that AAPL's intention to build and operate a safe pipeline is satisfied, the final pipeline design and operation supporting documentation will be subjected to an independent analysis and review by qualified pipeline engineers. The review would be conducted by the DOT and BLM, which have both the authority and adequate professional staffing to monitor the system design. The scope of the review will be to confirm compliance with applicable pipeline design codes, regulations and standards, standard industry practice, and mitigation measures identified in the Final SEIS.

Effectiveness: The safety review will ensure that final pipeline design incorporates adequate safety precautions.

Application: The safety review will cover the proposed pipeline and pump/heater station design, operating practices and procedures, and emergency response plans.

Measure SS-4: Studies of scour depth will be conducted by AAPL for major watercourses on the route selected prior to finalizing the design of each crossing (see Tables 3-5a, 4-42a, and 3-58a). The results of these studies will be used to determine the appropriate concrete weight and depth of burial. The methods used in this study and the results will be subject to the same independent review described in Mitigation Measure SS-3.

Effectiveness: These studies will ensure adequate precautions are taken to prevent pipeline damage from scouring during major runoff events.

Application: Studies of scour depth will be conducted for the selected pipeline route. For the Proposed Route, these studies will be conducted on the South Llano River, Pedernales River, Colorado River, San Bernard River, Brazos River, Highland Bayou, and Clear Creek.

For the Northern Alternative, these studies will be conducted on the South Concho River, Colorado River, Pecan Bayou, Leon River, Lampasas River, South Bosque River, Little River, Middle and East Yequa Creeks, Brazos River, Highland Bayou, and Clear Creek.

Scouring studies for the Southern Alternative will be conducted on the Devil's River, Nueces River, Sabinal River, Frio River, San Antonio River, Guadalupe River, Lavaca River, Navidad River, Colorado River, San Bernard River, Brazos River, Highland Bayou, and Clear Creek.

Measure SS-5: All manual valves will be capable of quick closure by introduction of an independent power source using electric or air impact tools. All pipeline maintenance vehicles will be capable of actuating the valves.

Effectiveness: This measure will shorten valve closure time, reduce spill volumes, and make the valve closure less strenuous for workers. On the average, this measure should reduce total spill volumes by about 5 percent over manual operation.

Application: This measure applies to all manually-operated block valves.

Measure SS-6: A suitable backup communications system (e.g., radio) to be approved by the Authorized Officer will be provided for pipeline operation.

Effectiveness: This measure will provide safeguards against total communications loss and provide backup methods for closing remote-control valves and shutting down pump/heater stations during an emergency.

Application: This measure applies to the pipeline and pump/heater stations for the Proposed Route and the alternatives.

Measure SS-7: The pipe coating (where not insulated) will be epoxy-type or equivalent in the Edwards Aquifer recharge zone. Sections of the pipe which are insulated will have the insulation applied over the coating after the integrity of the coating was confirmed. Equivalency of other coatings will be determined by the Authorized Officer.

Effectiveness: This measure will reduce the risk of failure from external pipe corrosion in critical areas. Historically, epoxy-type coatings have a very low failure rate. On the average, oil spill frequencies should be reduced between 25 to 30 percent.

Application: This measure applies to the Edwards Aquifer recharge zone.

Measure SS-8: In sensitive areas, 100 percent of all pipeline welds will be subject to non-destructive testing using radiography or equivalent methods as approved by the Authorized Officer. These areas include sensitive streams as identified in the Draft SEIS (Tables 4-15, 4-45, and 4-57), other riparian areas, wetlands, areas near sources of municipal water supplies, within 0.5 mile of the Caverns of Sonora, habitat of important wildlife species, and the Edwards Fault Zone Aquifer. Additional sensitive areas may be required at the discretion of the Authorized Officer.

Effectiveness: Testing of all welds will reduce the risk of a pipeline leak due to weld failure.

Application: This measure applies to the Proposed Route and the alternatives.

Measure SS-9: Pump/heater stations will be sited at a minimum 0.5 mile from permanent residences, public buildings, commercial buildings, etc. unless specifically exempted by the Authorized Officer.

Effectiveness: This measure provides a margin of safety in the unlikely occurrence of an explosion or major fire at a pump/heater station.

Application: This measure applies to all pump/heater stations.

Measure SS-10: The owner/operator of the crude oil pipeline from McCamey, Texas to Webster and Texas City, Texas will maintain at all times a comprehensive liability insurance policy or bond in the amount of $20 million for mitigation of potential damage caused or created by the owner/operator in the construction, operation, or abandonment of the pipeline.

Effectiveness: This measure will ensure that the costs of cleanup, restoration, and financial losses attributed to the pipeline are provided for by AAPL and any other future owner/operator(s) of the crude oil pipeline.

Application: This measure applies to the Proposed Route and both alternatives.

4.7.2 Groundwater

Measure GW-1: Hydrogeologic investigations will be conducted along the selected alignment. Investigations will concentrate on sensitive aquifers indicated in Table 3-1, the sensitive area in the vicinity of the City of Fredricksburg supply wells, and will also include the remainder of the route because groundwater may be locally important for municipal and agricultural uses. The goal of these investigations will

be to have appropriate information readily available in advance of a spill. At a minimum, the following information will be provided: number and locations of wells and significant springs by county; whether the wells or springs are upgradient or downgradient of the pipeline; a complete list of appropriate local, county, and state contacts; and a bibliography of appropriate groundwater references, grouped by county. Over 100 references are available from the Texas Water Commission (TWC) listing the wells and springs, by county, along each of the pipeline routes. In addition, the TWC has published Spill Response Maps for each Texas county. This information will be incorporated into the Oil Spill Contingency Plan that will include plans for notification of affected groundwater users, water districts, and appropriate governmental agencies; site-specific cleanup and response plans, and identification of emergency alternate water supplies.

Effectiveness: These hydrogeologic investigations and contingency plans will make appropriate information available to allow for early response to spills or leaks rather than attempting to obtain this information after a spill has occurred. This is particularly important in populated areas where groundwater is extensively used for municipal supplies.

Application: This measure will be applied to the Proposed Route and all alternatives.

Measure GW-2: See Measure SS-1; the Oil Spill Contingency Plan will address groundwater protection and cleanup. Descriptions of effective oil spill aquifer decontamination methods have been included. These methods include:

- Cleanup procedures
- Post-cleanup procedures
- Groundwater sampling
- Groundwater classification

Effectiveness: These methods are representative of the current oil spill cleanup technology. With the evolution of hazardous materials cleanup, new techniques are developed on a continual basis. With current technologies, the oil spill contamination can be reduced to no impact or at worst a local impact (e.g., one set of city wells). The likelihood of regional groundwater contamination (i.e., to the Edwards Aquifer) is very remote.

Application: This measure will be applied to the Proposed Route and all alternatives. The locations requiring site-specific treatment in the oil spill contingency plan are listed in Table 4-61c in Mitigation Measure SS-1.

Measure GW-3: Water supply wells or springs which are adversely impacted by the All American Pipeline during its construction, operation, or abandonment, will be cleaned up, repaired, or replaced as required by the nature of the impact. Any well damaged by blasting will be redrilled to remove caved rock. If the well caves in again following

redrilling, a screen or casing will be placed in the fractured zone. For water wells or water supply springs affected by oil spills, an alternative water supply will be provided that is equivalent in quantity and quality to the well/spring water prior to impacts. This alternative water supply may come from new or deepened well(s), from surface water, from an impacted well following appropriate treatment or renovation, or if necessary, from water trucked in and stored in tanks.

Effectiveness: The full restitution described above for wells or springs impacted by the pipeline will effectively mitigate impacts for losses from blasting and temporary or permanent impacts to supply wells or springs from oil spills.

Application: This measure will be applied to the Proposed Route and all alternatives.

4.7.3 Surface Water

Measure SW-1: See Measure SS-1; the Oil Spill Contingency Plan will address surface waters of importance to municipal and irrigation water users. A preliminary Oil Spill Contingency Plan has been prepared for representative streams (Appendix B of the Draft SEIS).

Effectiveness: The Oil Spill Contingency Plan is a proven technique for reducing water quality impacts. Measure SS-1 combined with Measure SS-2 should protect all municipal water supplies from service interruptions longer than 8 hours.

Application: This measure will be applied to the Proposed Route and the alternatives. See the Modifications and Corrections section for page B-53 and Table 4-61c in Mitigation Measure SS-1.

Measure SW-2: See Measure SS-2; the remote-control block valves listed in Table 4-62 will protect municipal water users from large volume oil spills.

Effectiveness: The remote-control valves reduce the loss of oil from high volumes of up to 87,200 barrels to 1,600 to 3,800 barrels.

Application: This measure will be applied to streams listed in Table 4-62.

4.7.4 Geology

Measure G-1: Geologic hazards requiring special design considerations will be determined on a site-specific basis and will be dependent on actual pipeline location. Reconnaissance activities in advance of construction will identify those locations and/or hazards that exhibit a high degree of potential risk to pipeline or facility integrity. These types of hazards might include active fault zones, karstic features such as sinkholes, slope stability (due to rock structure, hydrogeological factors, slope angle, etc.), or potential major storm event induced damage (such as at stream crossings). Where these hazards are appropriately identified in advance, an evaluation

will be made to determine what construction techniques can be employed that will provide a necessary factor of safety at an economic level, or conversely, if a minor realignment is required. Routine investigations will be carried out to determine the physical parameters of the soil or rock upon which the pipeline will be built. Drilling and test pits are common methods of obtaining samples of soil and rock materials, to determine analytically such critical parameters as bearing capacity, shear strength, internal friction angles, density, etc. With these parameters known, various mitigation measures can be designed and employed, such as buttressing, retaining walls, rock bolting, grouting, shotcreting, use of pilings in watercourses, etc. In addition to the overall hazard identification, standard geotechnical investigations will be employed at discrete locations of pump/heater stations and other significant structures.

It is common to encounter unexpected geologic hazards during excavation. Routinely these hazards are appropriately addressed immediately in the interest of worker safety as well as in the interest of protecting the longevity of operational life of the pipeline, since it represents a substantial capital commitment on behalf of the pipeline owner/operator.

Specific geologic hazard areas identified during the reconnaissance studies may require minor realignment of the route to avoid these hazards or the need for specialized design. At pump/heater stations, a program of standard geotechnical exploration and design will be performed.

Effectiveness: Such studies are standard for major civil structures and will identify existing significant geologic hazards such as landslides, unstable stream banks, subsidence, and karstic sinkholes. Areas with moderate to high potential for future development of geologic hazards will be avoided or mitigated by specialized design.

Application: This measure will be applied to pump/heater stations and identified sensitive geologic areas along the Proposed Route and all alternatives. See Table 3-7 and Map 3-3.

Measure G-2: Geologic hazards identified and characterized as a result of Measure G-1 will be addressed with specific mitigation which may involve avoidance by rerouting, remedial earthwork, or special structural or foundation design. In some cases, a program of surveillance and/or monitoring will be established to verify adequate performance (e.g., at a crossing of an inactive landslide), or warn of developing hazards (e.g., proximity to an active karst feature or a stream bank judged susceptible to failure during an extremely wet year).

Typical design modifications at river or stream crossings might address concerns such as scour, lateral migration of meanders or other changes in stream course, which could ultimately damage the pipeline's negative bouyancy components resulting in damage to the pipeline itself. Appropriate means to prevent such occurrences will include selective location of the pipeline with regard to scour depth in combination with protective coatings to minimize the potential for failure of the crossing.

Areas that have specific concerns related to slope stability, rock failure, etc., are routinely addressed (to protect pipeline structures) in extreme cases through slope laybacks (benching) and in more moderate cases through buttressing or retaining walls. Further, in many cases of lesser concern, rock bolting, grouting or shotcreting can be effectively utilized to reinforce rock structure, strengthen joint structures and alter hydrogeologic influences, or just minimize the likelihood and frequency of rockfalls.

Recommendations and design criteria for earthwork and foundations will be developed for pump/heater stations and selected pipeline segments.

Effectiveness: These mitigation measures are standard, being based on adequate investigations as specified in Measure G-1. The particular measure selected to accommodate a geologic hazard or geotechnical condition will be site and problem-specific, further enhancing the effectiveness of the measure.

Application: This measure will be applied to the Proposed Route and the alternatives.

Measure G-3: As determined by the Authorized Officer, special construction procedures will be followed within 2 miles of the unique geologic features at the Caverns of Sonora. These procedures will involve mechanical trench excavation without the use of explosives for blasting to minimize vibrations that might damage the caverns.

Effectiveness: Avoiding the use of explosives for trench excavation will prevent possible damage to unique and delicate features at the Caverns of Sonora. The rock trencher to be used by All American is capable of ripping through nearly any type of rock along the route, although it may proceed more slowly than blasting through hard rock. Trencher-induced vibrations are relatively minimal and would not damage fragile cave formations.

Application: This measure will be applied to the Proposed Route within 2 miles of the Caverns of Sonora in Sutton County.

Measure G-4: The pipeline will be rerouted around all active and proposed mineral and energy extraction areas which would be significantly impacted by the pipeline's presence.

Effectiveness: Rerouting the pipeline to avoid active or proposed resource extraction areas will eliminate impacts associated with extraction of minerals and energy resources.

Application: This measure will be applied to the Northern Alternative near the proposed Milam lignite mine such that the proposed mine area will not be crossed. The Northern Alternative would also be realigned to avoid crossing active or proposed mineral extraction areas if necessary near the Orchard Dome oil field.

Measure G-5: Where it is determined that blasting will damage an important resource, the BLM Authorized Officer will require trenching by other means. The risk to the resource will be mathematically determined through field application. The risk will be based on particle velocities in excess of 2 inches per second. Resources considered at potential risk include wells in limestone formations within 0.5 mile of the proposed trench.

Effectiveness: Blasting shock waves in excess of 2 inches per second will not be generated in the area of wells, and thus, damage of wells, and other features deemed at risk by the Authorized Officer will not occur. All significant impacts from blasting can be eliminated.

Application: This measure will be applied on the Proposed Route and the alternatives and specifically within 0.5 mile of limestone formation wells.

4.7.5 Soils

Measure S-1: In addition to the restoration measures presented in the project description, the Authorized Officer may require other means of restoring disturbed areas. For areas where no reclamation plans are prepared, where the risk of soil erosion and ROW stability is at risk, or where AAPL restoration fails, the Authorized Officer will require proper restoration. Techniques include double-lifting (topsoil segregation), reseeding (native species where applicable), and fertilization. Topsoil segregation will be especially important in agricultural areas.

Effectiveness: This measure will assist in minimizing potential revegetation and erosion control problems in the disturbed areas.

Application: This measure will be applied to the Proposed Route and the alternatives.

4.7.6 Aquatic Biology

Measure AB-1: Fueling and lubrication of construction equipment will not occur within 0.25 mile of water bodies. No more than 2 barrels of fuel (about 84 gallons) should be kept at construction sites within 0.5 mile of sensitive water bodies. Equipment will be periodically checked for leakage to avoid spills. If a spill does occur, it will be reported to the Authorized Officer immediately.

Effectiveness: Refueling away from water bodies and periodic maintenance should reduce the risk of construction-related spills by lower probabilities and frequencies of spills greater than 40 gallons in size.

Application: This measure will be applied to the flowing streams along the Proposed Route and the alternatives (see Tables 4-15, 4-45, and 4-57 of the Draft SEIS for list of sensitive water bodies).

Measure AB-2: Site-specific treatment in the oil spill contingency plan will be prepared for sensitive water bodies.

Effectiveness: Oil spill contingency plans will minimize the area affected by an oil spill and reduce resource losses and increase the speed of resource recovery.

Application: This measure will be applied to the Proposed Route and the alternatives (See Table 4-61c in Mitigation Measure SS-1).

Measure AB-3: Remote-actuated block and check valves will be used on stream crossings where oil spill loss due to lack of remote-control valves would be large and increase the magnitude of potential impacts on aquatic biota. Remote-control block valves are recommended for streams listed in Table 4-62.

Effectiveness: Remote-control block and check valves will reduce the volume of oil potentially reaching a stream.

Application: See Measure SS-2.

Measure AB-4: Blasting at sensitive stream crossings will be done in the dry season with percussion wave obstructions, or will be scheduled to avoid the spawning period of important recreational and threatened or endangered fish species. Blasting also will: 1) occur during the expected lowest flow period in the fall, and 2) will employ temporary structures to reduce shock waves.

Effectiveness: The avoidance of fish spawning periods in the summer will minimize or eliminate potential impacts to early life stages of fish, which are considered the most sensitive to blasting. The use of structures to reduce shock waves and scheduling blasting during fall low flow periods will reduce the areas affected by blasting.

Application: This measure would be applied to important streams along the Proposed Route and the alternatives (see Tables 4-15, 4-45, and 4-57 of the Draft SEIS for list of sensitive water bodies).

4.7.7 Terrestrial Biology

Measure TB-1: Construction through sensitive plant and animal communities and habitat (e.g., riparian vegetation, wetlands, native prairie, or habitats of federal candidate or state threatened species) will be supervised directly by an onsite representative of the BLM Authorized Officer. Whenever possible, the Authorized Officer will ensure that the pipeline will avoid sensitive communities and habitats. The Authorized Officer will determine the feasibility of avoiding specific areas or reducing ROW widths through these sensitive areas. If the Authorized Officer determines the area cannot be avoided, disturbed areas will be restored (where feasible) in 5 years as specified in an approved vegetation restoration plan. The plan would be developed using appropriate materials and techniques as suggested by local SCS revegetation specialists (or other appropriate agencies) with input and/or approval from private landowners.

Where (and only where) the Authorized Officer determines that neither avoidance nor reclamation is feasible, long-term disturbance to riparian and wetland areas will be compensated. For example, if a pipeline stream crossing were to result in the long-term disturbance or loss of 1 acre of riparian habitat, 3 acres of comparable value riparian habitat will be identified and purchased to replace the lost area. The acquired area will be deeded to an appropriate conservation agency or organization. Actual acreages to be impacted and compensated will be determined after selection of a final route and detailed centerline surveys across these habitats. The majority of the riparian areas are found along the perennial rivers and creeks listed in Tables 3-4, 3-40, and 3-58 of the Draft SEIS. Wetlands more commonly occur within the Blackland Prairie/Post Oak Savannah and Gulf Prairies and Marshes regions, east of the Edwards Plateau.

This measure was developed as a result of a meeting on July 1, 1987 involving BLM, the U.S. Fish and Wildlife Service, the Texas Parks and Wildlife Department, and All American Pipeline Company. All four parties agreed to the final text of the measure, and concurred that it should and will be implemented.

Effectiveness: Avoiding and minimizing disturbance to sensitive areas will minimize loss of vegetation and wildlife habitat in those areas. This measure will also result in the long-term replacement of all wetland and riparian habitat lost from pipeline construction.

Application: This measure will be applied to the Proposed Route and the alternatives.

Measure TB-2: Vehicle operation off the ROW by construction workers or the BLM Authorized Officer will be prohibited except where specified by the landowner.

Effectiveness: Limiting vehicle use off the ROW will minimize the risk of impacting livestock, exotic ungulates, wildlife habitat, and wildlife including special status species, and important or sensitive vegetation in surrounding habitats.

Application: This measure will be applied to the Proposed Route and the alternatives.

Measure TB-3: During construction, the open pipeline trench and/or staged above-ground pipe will be limited to 0.5 mile in areas where the pipeline could limit wildlife access to water or other sensitive habitats. Skip sections or temporary bridges across the pipeline trench will also be used if more than 0.5 mile of trench must remain open for an extended period.

Effectiveness: This will minimize impacts caused by water stress and disruption of movement patterns.

Application: This measure will be applied to the Proposed Route and the alternatives. It will be applied in all wildlife movement corridors including the deer relocation area in Milan County. It will also be applied on all managed game ranches and other important areas; including riparian, as determined by the Authorized Officer.

Measure TB-4: A competent wildlife biologist will survey all potential raptor nesting habitat within 0.5 mile of the pipeline prior to construction. Active and inactive nests will be identified. No construction will occur within 0.5 mile of active nest sites during the nesting season identified for individual species by the USFWS. Construction will be permitted near inactive nests; however, no tree or cliff nest sites will be disturbed.

Effectiveness: This measure will prevent nest abandonment resulting from pipeline construction. It will also help provide flexibility for construction scheduling.

Application: This measure will be applied to appropriate habitat on the Proposed Route and the alternatives.

Measure TB-5: Site-specific portions of the Oil Spill Contingency Plan will identify special measures which will be instituted to protect wetlands. Oil spill booms will be deployed as near as possible to divert oil away from the wetlands downstream of major river crossings. The site-specific sections of the oil spill contingency plan will include areas of wetlands, riparian areas, bottomland hardwoods, and endangered species habitats as well as other selected areas. In the event of a spill, these booms would be used to prevent oil from entering backwater wetlands from the river. See Measure SS-1.

Effectiveness: Booms have been used effectively for many years in containing oil and directing it to areas for cleanup. Locating booms upstream of sensitive areas will minimize response time and minimize the possibility of oil reaching these sensitive habitats.

Application: This measure will be applied to all major stream crossings on the Proposed Route and the alternatives at wetlands and endangered species habitats as listed in Table 4-61c in Mitigation Measure SS-1. This listing includes protecting habitat for Houston toad, Attwater's greater prairie chicken, bald eagle, Concho water snake, Texas blind salamander, San Marcos salamander, and Texas wildrice.

Measure TB-6: Where the pipeline ROW follows an existing ROW, if possible the old ROW will be used as part of the construction ROW and new disturbance will be limited to the area needed for trenching and stockpiling backfill.

Effectiveness: Using the existing ROW for construction will minimize the total area cleared, wildlife habitat lost, and area to be revegetated. Using the existing ROW will significantly minimize the total acres disturbed. This approach will be especially useful in minimizing impacts to habitats of certain special status species such as the black-capped vireo and golden-cheeked warbler.

Application: This measure will be applied to the Proposed Route and the Southern Alternative. This technique will be applied along the Oasis Pipeline and where possible in riparian crossings.

Measure TB-7: County Extension Agent(s) or a recognized expert on oak wilt disease will survey the route prior to construction to confirm whether or not the pipeline ROW and adjacent areas are experiencing this disease. If the disease is present, a program will be developed with guidance from local experts to minimize the chance of a disease outbreak along the ROW. This program will include, but not be limited to, treating injured trees with wound paint, chemically treating and burning diseased trees in place, scheduling clearing activities between June 15 and February 28 (when insects and fungus are least active), and post-construction monitoring. All bulldozers, backhoes, and machinery will be steam-cleaned before leaving a contaminated area. Field tools will also be cleaned, as appropriate.

Effectiveness: This measure will reduce the potential for spreading oak wilt disease to adjacent disease-free areas, resulting in potentially severe losses of oak trees.

Application: This measure will be applied to the Proposed Route and the alternatives in those counties identified in the Draft SEIS as being particularly susceptible to oak wilt disease (i.e., Proposed Route: Kerr, Gillespie, Blanco, Hays, Caldwell, Bastrop, Fayette, Kimble, Colorado; Northern Alternative: Hamilton, Coryell, McClennan, Lee, Fayette, Brown, Mills, Falls, Bell, Milam, Burleson, Austin; Southern Alternative: Atascosa, Bexar, DeWitt, Lavaca, Uvalde, Medina, Wilson, Karnes).

Measure TB-8: To reduce the risk of pipeline leaks from corrosion, the pipe wil be covered with epoxy-type coatings 100 feet before and 100 feet after all streams and rivers, as well as in the river itself, to be crossed where there are downstream bald eagle nests (Colorado River crossing in Colorado County; Brazos River crossing; Rabbs Creek crossing in Fort Bend County).

Construction will occur near bald eagle nest sites between Worthington Lake and Rabbs Bayou along the Proposed Route in Fort Bend County. If construction is to be performed after October 15, 1987, within 2 miles of the confluence of Rabbs Bayou and Big Creek, another search for bald eagle nests will be made. If a nest is found within

1 mile of the pipeline, no construction will be done between October 15 and May 15. If terrain or other natural features break the line of sight between the new nest location and the pipeline, the distance from the nest to the pipeline may be reduced to less than 1 mile after further consultation with the Service. If the nest is unsuccessful, construction may occur during the period February through May 15, with approval from the Service. No nest, either active or inactive, will be destroyed by pipeline construction.

Effectiveness: This measure will reduce the risk of nest destruction and abandonment during the construction period, and reduce the risk of oil spills upstream of nest sites.

Application: This measure will be applied to the Proposed Route and both alternatives, where applicable.

Measure TB-9: Construction along the Northern Alternative would occur in the known range of the Concho water snake on the Colorado River. The recommended mitigation by the FWS is to select either the Proposed Route or Southern Alternative. If the Northern Alternative is selected, the following mitigation will be done to reduce potential impacts to the Concho water snake. (The following is a direct quote from the USFWS Biological Opinion - August 21, 1987.)

a. Conduct an on-site inspection of the Colorado River crossing to determine if juvenile snake riffle habitat occurs in the area. The area will also be evaluated for the presence of individual snakes. If the proposed crossing site contains riffled habitat, the pipeline route will be realigned to a nearby pooled area which will minimize impacts to individual juvenile water snakes.

b. Additional riffle habitat will be created during pipeline construction by distributing the debris which occurs as a result of pipeline excavation. Specific construction techniques will be implemented which will minimize degradation of water quality, sedimentation, and erosion.

c. A site-specific oil contingency plan will be developed to ensure that if a leak did occur, it would be detected and shut off rapidly. This plan will be prepared prior to project operation and must be acceptable to the Service. The plan will include such features as designation of equipment storage areas, maintenance program for equipment to ensure it is in proper working order, organization of response team, techniques to be used for spill containment and cleanup, and post spill restoration procedures.

d. The area on both sides of the creek crossing and the crossings of other drainage areas that feed into the Concho or Colorado Rivers will be marked with pipeline signs at a maximum of 1,000 feet intervals which will be maintained annually to ensure their readibility. In addition, safety tape will be installed above the pipeline to warn people excavating in the area that there is a buried pipeline.

e. Visual inspections will be conducted at least 26 times per year, not to exceed a 3-week interval, for the pipeline route throughout the drainage area for the Colorado River. The "pig" inspection will occur at least once every 2 weeks. These surveys will identify potential problems such as buckling or depressions near the pipeline, evidence of erosion, and potential leaks.

f. The pipeline will be coated with an epoxy coating to protect it from corrosion.

g. Remote check and block valves will be used on either side of the Colorado River. These valves will have a manual capability and the block value will be augmented with the remote terminal unit.

h. Multiple leak detection communications systems will be installed.

i. The concrete jacket, which will encase the pipe under the Colorado River, will be extended to the 100-year flood elevation.

Effectiveness: These measures will reduce construction impacts (direct mortality) to adult and young Concho water snakes, and reduce the severity and potential for downstream impacts from an oil spill.

Application: These measures will be applied to the Northern Alternative at the Colorado River crossing.

Measure TB-10: Attwater's greater prairie chicken field clearance surveys identified an active lek south of Sealy in Austin County (Figure 4-1a) and an active lek southeast of Orchard in Fort Bend County (Figure 4-1b). No other active leks or habitat that might be adversely impacted were identified. The BLM Authorized Officer will require timing constraints for the Sealy lek and a reroute and construction modification at the Orchard site.

Construction will not occur between 4:00 a.m. and 9:30 a.m., January through May within 1 mile of the Sealy lek. Within 2 miles of this lek, there will be no moving or shredding of the pipeline ROW between January 1 and August 1. The route at the Orchard site has been realigned to the active agricultural land about 1.5 miles to the north (see Figure 4-1b). If construction occurs within 2 miles of the lek at Orchard, during the period of April 1 through July 15, a 30-foot-wide skip or fill section will be provided per 0.25 mile of trench to allow movement of the young across or out of the trench. Also, an inspection of the open trench will occur each morning between April 1 and June 15 to remove any chicks that may have fallen in. These birds will be placed in a safe location near the trench. The status of this lek will be reconfirmed during the year of construction.

Effectiveness: The 4:00 a.m. to 9:30 a.m. timing constraint will protect active leks from noise disturbance. The realignment will move the ROW from the lek by 1.5 miles and out of quality nesting habitat and into rice rotation fields. The 0.25-mile skip sections will provide passageways for broods across the trench and also allow broods that may fall into the trench to escape without injury.

Application: These measures will be applied to the Northern Alternative in known Attwater's greater prairie chicken habitat in Austin and Fort Bend Counties (Figures 4-1a and 4-1b, respectively).

Measure TB-11: An evaluation was completed in June 1987 to determine if habitat for black-capped vireos occurs in or adjacent to the ROW. Vireos are known to nest near the Proposed Route, and habitat for this species is also crossed by both alternatives on the Edwards Plateau. Additional field surveys will be required in the spring of 1988, prior to clearing, along the selected route on the Edwards Plateau or in western Texas. Potential habitat identified in 1987 will be surveyed from the ground to identify nesting pairs and nests, and to evaluate habitat quality. If nests or breeding areas are found in the ROW, the pipeline will be moved to avoid this area. No habitat occupied by vireos will be disturbed. If construction will occur adjacent to occupied habitat, construction may be delayed until after the nesting season, per discussion with the FWS.

Effectiveness: These measures will reduce further habitat reduction and reduce the possibilities of direct mortality to nestlings or adults and reduce disturbance to nests adjacent to the ROW.

Application: This measure will be applied to the Proposed Route and the alternatives.

Measure TB-12: Specific habitats of individual federal candidate and state threatened species will be surveyed based on USFWS recommendations. A qualified wildlife biologist and botanist at each clearing and construction spread will evaluate the potential occurrence of individual special status species. If suitable replacement habitat is available and survival is likely, the individual animals will be captured and relocated prior to disturbance. If sensitive plant species are located, mitigation measures to be applied include realignment, ROW reduction, and transplanting of species, as determined to be appropriate by the Authorized Officer.

Effectiveness: Although this method will not eliminate all impacts to these species, it will greatly reduce impacts by identifying and locating important habitats for special status or listed species. Some plant and animal species may be relocated to nearby suitable habitat.

Application: This measure will be applied to the Proposed Route and the alternatives. The special status species and habitats are identified in Tables 3-14, 3-47, and 3-66 in Modifications and Corrections Section 3.2.

Measure TB-13: An oil spill at river, creek, or bayou crossings could affect special status species (i.e. birds, marine turtles) in Galveston Bay, and possibly Matagorda and San Antonio Bays. Site-specific treatment in the Oil Spill Contingency Plan will be required for each of the crossings where a spill has a high potential for reaching these bays. A preliminary oil spill contingency plan has been prepared for Highland Bayou (see Appendix B); also see Mitigation Measures SS-1 and SS-2.

Effectiveness: This measure will increase the chances that a spill would be contained before reaching the bays by having a predetermined deployment technique in case of an oil spill.

Application: These measures will be applied to the Proposed Route and the alternatives where the pipeline crosses the San Antonio River, Guadalupe River, Brazos River, Colorado River, San Bernard River, Oyster Creek, Clear Creek, Mustang Bayou, and Chocolate Bayou.

Measure TB-14: Field clearance surveys conducted in March and April of 1987 indicated the absence of Texas snowbells and Tobusch fishhook cactus populations along or adjacent to the pipeline ROW. In the event that potential habitat is encountered during construction, the measures to minimize impacts outlined in Mitigation Measure TB-12 would be implemented.

Effectiveness: These measures will help reduce impacts to these federal endangered plant species.

Application: These measures will be applied to the appropriate segments of the Proposed Route and Southern Alternative.

4.7.8 Cultural Resources

Measure CR-1: The BLM will require as a minimum that all mitigation measures indicated below be implemented. The BLM has entered into a Programmatic Memorandum of Agreement (PMOA) with the SHPO in each state crossed by the pipeline and with the Advisory Council on Historic Preservation (ACHP) for the previous portion of the project. A supplemental Memorandum of Agreement (MOA) has been signed by the BLM, Texas SHPO, and ACHP for the purpose of clarifying the PMOA and making it specifically applicable to the pipeline east of McCamey. In addition to specific requirements of the PMOA and MOA, the following requirements will be implemented as mitigation measures to complement and supplement the existing procedures.

- Under the direction of the BLM's Authorized Officer, AAPL will conduct an intensive cultural resources survey of all lands affected by the project. The cultural resources survey will be designed in consultation with the Authorized Officer and Texas SHPO in development of the cultural resources plan pursuant to the PMOA. The AAPL will survey all lands as directed by the Authorized Officer. The Army Corps of Engineers (COE) will require a 100 percent inventory of

cultural resources within their permit area as affected by the project. The Authorized Officer, in consultation with the Texas SHPO, may determine that some areas or specific locations do not warrant inventory. The Authorized Officer will notify AAPL of such a determination. The survey will include the entire construction ROW (normally 100 feet wide). The survey interval will be no greater than 15 meters between transects or as specified in the cultural resources plan. The centerline of the corridor will be flagged by the pipeline company prior to the survey. All new access roads will be fully inventoried. All ancillary facilities and/or land surfaces that will be disturbed by construction or used in construction (e.g., pump-heater stations, borrow pits, etc.), including temporary work space, will be inventoried to the same standards as above.

- Where large cultural resource sites are encountered, the lateral limits of survey will be expanded accordingly in order to fully record the property and explore avoidance options. This may be accomplished during All American's preliminary routing survey. An archaeologist would accompany the preliminary survey crew to conduct a preliminary cultural survey to identify significant sites where excavation work may be necessary. At such locations, a pedestrian walk over will take place to determine the parameters of the potential site in the vicinity of the ROW. A field observation report will be required. Upon completion of the route selection process, identification, evaluation, and treatment of cultural resources within the ROW will be accomplished in accordance with the provisions of the project PMOA.

- All cultural resources encountered during the course of the inventory will be recorded employing State of Texas site forms and procedures acceptable to each appropriate federal jurisdiction, and to the Texas SHPO.

- In addition to and not in substitution of any obligation contained in the PMOA, to the extent that the company must secure a court order to enter property for a preliminary survey, it will request that the court order specify, subject to the descretion of the court, the presence of an archaeologist for the purpose of site identifications.

  Upon completion of the route selection process, identification, evaluation, and treatment of cultural resources shall be done in full compliance with the terms and conditions of the PMOA in effect for the project. Upon completion of the cultural resources program, all artifacts will either be returned to the landowner if so requested in the landowner's grant of permission, or curated in accordance with the provisions of the PMOA.

- Sufficient information must be obtained at the time of the survey to determine whether or not sites are potentially eligible for inclusion on the National Register of Historic Places. Criteria for determining National Register eligibility are found in 36 CFR 60.4.

- All previously recorded sites that occur within the construction ROW or other areas that will be impacted by construction will be field checked to determine potential eligibility for inclusion on the National Register of Historic Places. Site records will be updated using forms approved by the Authorized Officer. Sites that have already been determined to be ineligible in formal consultation with the appropriate SHPO shall not be rechecked.

- All CRCs will obtain appropriate permits prior to conducting cultural resource survey work on federal and state lands and must follow all stipulations of the permits. The Texas Antiquities Committee (TAC) and U.S. Army will require cultural resource permits for work conducted on state and Army lands, respectively.

- Native American consultation requirements per the American Indian Religious Freedom Act and Archaeological Resources Protection Act will be developed as an aspect of the cultural resources plan as specified by the Texas SHPO. At a minimum, the following Native American groups will be contacted for comment:

  Comanche Tribe, Lawton, Oklahoma
  Kiowa/Kiowa Apache, Carnegie, Oklahoma
  Mescalero Tribe, Mescalero, New Mexico
  Tonkawa Tribe, Tonkawa, Oklahoma
  Alabama-Coushatta Tribe, Polk County, Texas
  Kickapoo Tribe of Oklahoma
  Caddo Tribe of Oklahoma
  Wichita and affiliated tribes of Oklahoma

- The cultural resource contractors and subcontractors must apply for appropriate permits and authorizations for mitigation on sites they wish to work on. Processing of permits and treatment programs can begin as soon as the treatment report is accepted and concurrently with the SHPO consultation.

- Following completion of all mitigation fieldwork for a given segment of the pipeline and prior to the issuance of a notice to proceed and construction, a progress report will be submitted to the Authorized Officer for approval summarizing fieldwork conducted in compliance with the approved treatment program.

- The Cultural Resource Contractor for the Holder will post a completion bond to assure their fulfillment of obligation for analysis and submission of draft final mitigation reports in a

timely manner. Where the prime contractor is a state institution and the state gives written documentation of its inability to post bond, the liability for the bond will be assumed by the Holder.

Effectiveness: Where these measures are followed, cultural resources will be protected where prudent and feasible. These actions, and consultation under Section 106 of the National Historic Preservation Act, will ensure that the effects of the pipeline construction and operation on cultural resources were fully considered as required by law.

Application: This measure applies to the Proposed Route and the alternatives.

4.7.9 Paleontology

Measure P-1: Mitigation of adverse impacts on paleontological resources will consist of the following elements.

- Pre-construction literature survey of geological maps and previous investigations to determine areas having potential to produce vertebrate remains at or near the surface. Such areas are limited in size and distribution.

- Where landowner approval is secured, monitoring and removal activities will be conducted.

- On-location monitoring or pipeline construction (ditching, boring) through all geological units ranked as high or medium in paleontological sensitivity.

- Removal of significant vertebrate fossil remains discovered during monitoring, employing appropriate excavation, and stabilization techniques.

- Analyzing, reporting, and adequate curation of all collected vertebrate fossil materials.

Effectiveness: Implementation of this measure will minimize the adverse effects of pipeline construction on paleontological resources and will result in an increased understanding of the stratigraphy and fossil fauna of the project vicinity. Since the high and medium sensitivity areas comprise approximately 120 miles and monitoring and removal activities are done after trenching in a manner that does not interfere with pipeline construction, the additional impact on the project from this measure is not significant.

Application: This measure applies to the Proposed Route and the alternatives.

4.7.10 Air Quality and Meteorology

No air quality mitigation measures are required for the construction or operation of the Proposed Route and the alternatives.

4.7.11 Land Use and Recreation

Measure LU-1: See Measure SS-2, installation of remote-control block valves to reduce oil spill volumes from potential leaks or ruptures.

Effectiveness: This measure will reduce the volume of oil and will expedite containment and cleanup.

Application: This measure will be applied to the Proposed Route and the alternatives.

Measure LU-2: See Measure SS-1; site-specific treatment in the Oill Spill Contingency Plan will be prepared for all sensitive areas.

Effectiveness: This measure will reduce the loss of croplands and recreational resources, especially water-oriented recreation which is highly vulnerable to oil spills.

Application: This measure will be applied to the Proposed Route and the alternatives.

Measure LU-3: Temporary fences will be installed with the approval of the landowner at all managed big game wildlife properties to keep animals from escaping or being injured as a result of fence cutting and open trenches. Identified breeding areas for native and exotic stock should be avoided at peak breeding periods.

Effectiveness: This measure will eliminate the financial loss to ranchers resulting from loss of exotic and native big game species.

Application: This measure will be applied to the Proposed Route and the alternatives.

Measure LU-4: The utility corridors and access roads cannot be identified until final engineering design is completed for the pump/heater stations along the selected route. Where not categorically excluded, the BLM will prepare environmental assessments for these facilities.

Effectiveness: Environmental assessments are required by NEPA for support facilities which cannot be accurately defined at the time of the EIS and which could potentially result in significant impacts.

Application: This measure is applicable to all utility corridors for new transmission lines, natural gas lines, and access roads for the Proposed Route and the alternatives.

4.7.12 Socioeconomics

No socioeconomic mitigation measures are required for the Proposed Route or the alternatives.

4.7.13 Transportation

Measure T-1: All roads damaged specifically by AAPL or its contractor will be repaired to the condition equal to or better than the original condition at the initiation of construction. The Authorized Officer will make the determination on damage and extent of repairs.

Effectivness: It is not anticipated that significant damage will occur because of construction traffic; however, should such damage occur, the Authorized Officer will have the authority to rectify any losses.

Application: This measure will be applied to the Proposed Route and the alternatives.

4.7.14 Visual Resources

Measure VR-1: The pipeline approaches to the South Llano River/ U.S. 377 crossing will be routed to minimize visual exposure to passers by. Vegetative clearing in view of the roadway will be done with irregular feathered edges.

Effectiveness: The combination of careful route selection and feathered clearing edges will visually suggest a natural rather than man-made clearing and will minimize the visual contrast of the pipeline crossing. The contrast of a sharp edge clearing at the South Llano River crossing illustrates the need for mitigation (see Figure 4-2).

Application: This measure will be applied to the South Llano River/U.S. 377 crossing on the Proposed Route.

4.7.15 Noise

Because of the short duration of construction impacts in any one area (typically 2 weeks or less), limiting construction to daytime hours (as described in the Project Description), and the low probability of accomplishing effective mitigation of high noise levels associated with construction activities, mitigation is not considered to be warranted for construction noise effects beyond the standard requirements for use of effective equipment mufflers and compliance with OSHA requirements.

Measure N-1: Final selection of pump/heater station sites and siting of the equipment on the sites will provide for pumps and heaters to be located a minimum of 0.5-mile from the nearest residence or other noise sensitive receptor.

Effectiveness: This will ensure the 1,500-ft separation required to reduce noise levels at sensitive receptors below the 65 dBA significance threshold.

Application: This measure will apply to all pump/heater station sites, particularly Station 4 on the Proposed Route; Stations 4, 5, and 6 on the Northern Alternative; and Stations 4 and 6 on the Southern Alternative where residences have already been identified in the site vicinities.

REVISED TABLE 4-63

IMPACT SUMMARY FOR THE PROPOSED ROUTE

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
System Safety and Reliability				
Construction	None	NA[1]	NA	NA
Operation	The spill frequency rate would be 4.017×10^{-4} spills per mile-year (except for the Edwards Aquifer 2.246×10^{-4} spills per mile-year). The expected number of spills in 40 years would be 7.8 (0.057 for the Edwards Aquifer). The average spill volume would be 3,750 barrels (2,700 barrels for the Edwards Aquifer).[2]	SS-1, SS-2, SS-3 SS-4, SS-5, SS-6 SS-7, SS-8, SS-9	Minimize the volume of an oil spill. Implementation of these measures will not reduce the overall spill frequency rate of 4.017×10^{-4} spills per mile-year. The spill rate for the Edwards Aquifer will be reduced to 1.619×10^{-4} spills per mile-year. The expected number of spills in 40 years will be 7.8 (0.041 for the Edwards Aquifer). The average spill volume will be 3,350 barrels (2,400 for the Edwards Aquifer).	Yes[2]
Groundwater				
Construction	Groundwater quality degradation resulting from cathodic deep-well groundbeds.	GW-2	Proper construction standards will eliminate impacts.	No
	Damage to wells from blasting.	GW-3	Repair or replace damaged wells.	No
Operation	Degradation of groundwater quality resulting from an oil spill in sensitive aquifers (Table 3-1). Highly sensitive Balcones Fault Zone Aquifer could be affected.	GW-1, GW-2, GW-3, GW-4, SS-1, SS-2, SS-3, SS-5, SS-6, SS-7	Minimize the volume of oil spilled and areas affected by implementing an OSCP. Hydrogeologic investigations and repair or replacement of damaged wells will effectively mitigate impacts to individual wells. There will be some potential for long- or short-term unmitigable impacts to affected aquifers; system safety measures will reduce the overall risk of contamination.	Yes
Surface Water				
Construction	None	NA	NA	NA
Operation	Major oil spills or leaks could degrade water quality below federal and state standards and affect downstream users. Water bodies potentially affected are listed in Table 4-11.	SS-1, SS-2, SS-3 SS-4, SS-5, SS-6 (see Footnote[3])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]

REVISED TABLE 4-63 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Geology				
Construction	Possible effects of blasting on Caverns of Sonora.	G-3	Elimination of blasting near the Caverns of Sonora will effectively avoid impacts.	No
Operation	Potential hazards and risks due to slope failures near the Brazos River crossing.	G-1, G-2	Identify need for realignment or specialized design	No
	Potential damage to Caverns of Sonora due to an oil spill.	G-5, SS-1, SS-3, SS-5	Blasting shock waves in excess of 2 inches per second will not occur, and thus, significant impacts would be avoided.	Yes[3]
Soils				
Construction[5]	None	NA	NA	NA
Operation	None	NA	NA	NA
Aquatic Biology				
Construction	Potential reduction in diversity and abundance of important fish species in important water bodies due to a fuel or lubricant spill (see Table 4-15 for list of water bodies).	AB-1	Substantially reduce the probability and frequency of spills greater than 40 gallons reaching streams.	No
	Potential reduction in diversity and abundance of important fish species in important streams as a result of blasting (see Table 4-15 for list of streams).	AB-4	Mininize or eliminate impacts to early life stages of fish by avoiding spawning/rearing periods and reducing areas affected by blasting.	No
Operation	Potential reductions in diversity and abundance of important fish species in important streams and reservoirs due to a major oil spill (see Table 4-15 for list of streams and reservoirs).	SS-1, SS-2, SS-3, SS-4, SS-6, AB-2, AB-3 (see Footnotes [3,6])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]
	Potential reductions in abundance of important finfish and shellfish species in Gavleston Bay, Matagorda Bay, and the Gulf Coast near Freeport due to a major oil spill into streams without downstream reservoirs.	SS-1, SS-2, SS-3, SS-4, SS-6, AB-2, AB-3, (see Footnotes[3,6])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]

REVISED TABLE 4-63 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Terrestrial Biology Construction	Loss of approximately 138 acres of riparian habitat mainly along the major river bottomlands in Wharton, Fort Bend, and Brazoria Counties.	TB-1	Minimize disturbance and loss of riparian vegetation. Provide long-term replacement of riparian habitat lost from pipeline construction.	No
	Possible spread of oak wilt disease to disease-free areas along the ROW from Kimble to Colorado Counties.	TB-7	Reduce the potential for spreading oak wilt disease.	No
	Potential loss of federal endangered plant species/habitat for Texas snow-bells and Tobusch fishhook cactus (Sutton County to Hays County).	TB-14[6]	Reduce loss of individuals and habitat.	Yes
	Possible loss of individuals or habitat removal for six federal candidate and/or state sensitive plant species: Jone's selenia (Crockett County); big red sage (Gillespie County); Buckley tridens (Hays County); Texas windmill grass (Brazoria County), smooth blue star (Galveston County); and coastal gayfeather (Galveston County).	TB-1, TB-12	Minimize disturbance and habitat loss to these sensitive species.	No
	Possible disturbance to bald eagle nesting south of Lake Worthington.	TB-8[6]	Reduce the risk of nest abandonment.	No
	Possible loss of individuals or habitat for federal candidate and state threatened species (see Table 3-14 for list of species and locations).	TB-1,TB-2, TB-4, TB-5, TB-6, TB-11, TB-12	Reduce loss of individuals and habitat.	No
Operation	Potential reductions in abundance of waterfowl, marsh birds, and aquatic mammals (i.e., beaver, muskrat, nutria) in downstream rivers reservoirs, and coastal areas (Galveston Bay, Matagorda Bay, and near Freeport) due to a major oil spill.	SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, TB-5, TB-13 (see Footnote[3])	Minimize the volume of an oil spill, areas affected, and effects on sensitive species by implementation of these measures.	Yes[4]
	Potential direct or indirect effects of a major oil spill on federal and/or state listed species (see Table 3-14 for list of species and location).	SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, SS-7, TB-5, TB-13 (see Footnotes [3,6])	Minimize the volume of an oil spill, areas affected, and effects on sensitive species by implementation of these measures.	Yes[4]

REVISED TABLE 4-63 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Cultural Resources				
Construction	Potential disturbance to 99 known historic or prehistoric sites, plus an indeterminate number of unrecorded sites, within the construction corridor.	CR-1	Cultural resource compliance plan will ensure that adverse impacts are avoided or minimized.	Yes
Operation	Potential impacts to 26 known historic or or prehistoric sites, plus an indeterminate number of unrecorded sites, due to increased accessibility along the route.	CR-1	Cultural resource compliance plan will ensure that adverse impacts are avoided or minimized.	Yes
Paleontology				
Construction	Potential disturbance to the following sensitive areas: Cook Mountain, Oakville, Fleming, Beaumont, Glen Rose, Eagle Ford Group, and Buda Formations; Edwards Plateau caves; and Pleistocene Terraces at the Pedernales, Colorado, Onion, Live Oak, and Johnson Draw stream crossings.	P-1	Avoid or minimize adverse impacts by implementing an inventory/monitoring plan.	Yes
Operation	None	NA	NA	NA
Air Quality				
Construction	None	NA	NA	NA
Operation	None	NA	NA	NA
Land Use and Recreation				
Construction	Potential loss of managed exotic and native big game species as a result of fence cutting and open trenches.	LU-3	Minimize financial loss to ranchers.	No
Operation	Potential effects on recreational activities in downstream rivers and reservoirs and coastal areas (see Table 4-32 list of water bodies and uses).	SS-1, SS-2, SS-3, SS-4, SS-6 (see Footnote[3])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]
Socioeconomics				
Construction	None	NA	NA	NA
Operation	None	NA	NA	NA

REVISED TABLE 4-63 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Transportation				
Construction	None	NA	NA	NA
Operation	None	NA	NA	NA
Visual Resources				
Construction	Disturbance to visual quality at the U.S. Highway 377 and South Llano River crossing.	VR-1	Minimize the visual contrast of the pipeline crossing.	No
Operation	None	NA	NA	NA
Noise				
Construction[7]	Construction noise would exceed 65 dBA at urban residences along the ROW just west of Highway I-35, and at residences in Dale, Pleak, Manvel, Alvin, and two urban developments 3 to 4 miles west of Webster; also at an unspecified number of farm, ranch, and rural non-farm residences.	None	NA	Yes
Operation	Operation noise from pump station 4 (Seguin) would exceed 65 dBA at two residences.	N-1	The 1,500-ft separation will be sufficient to reduce noise levels below 65 dBA.	No
Abandonment	If the entire pipeline were salvaged, noise impacts would be similar to the construction phase.	None	NA	Yes

[1]NA = Not Applicable.

[2]Oil spills could cause significant impacts to various resources depending upon the size and location of the spill. Specific mitigation measures for oil spill impacts to sensitive resources are provided in appropriate sections.

[3]Use of these mitigation measures would substantially reduce the oil spill risk.

[4]Level of significance would depend upon the volume of the spill, time of year, physical characteristics of the stream, and sensitivity of important organisms present.

[5]Although construction activities would accelerate soil erosion and deposition and decrease productivity in certain areas, no significant impacts would occur with the implementation of sound mechanical erosion control and revegetation techniques.

[6]Measures to avoid impacts to federal listed species are considered conservation measures.

[7]Because of short duration of impacts, limitation to daytime hours for construction, and low probability of accomplishing effective mitigation for the noise of mobile construction activity, mitigation beyond standard use of equipment mufflers and similar OSHA requirements is not considered to be warranted.

REVISED TABLE 4-64

IMPACT SUMMARY FOR THE NORTHERN ALTERNATIVE

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
System Safety and Reliability				
Construction	None	NA[1]	NA	NA
Operation	The spill frequency rate would be 4.017×10^{-4} spills per mile-year. The expected number of spills in 40 years would be 8.8. The average spill volume would be 3,750 barrels.[2]	SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, SS-8, SS-9	Minimize the volume of an oil spill. Implementation of these measures will not reduce the spill frequency rate. The expected number of spills in 40 years will be 8.8. The average spill volume will be 3,350 barrels.	Yes[2]
Groundwater				
Construction	Groundwater quality degradation resulting from cathodic protection deep-well ground beds.	GW-2	Proper construction standards will eliminate impacts.	No
	Damage to wells from blasting.	GW-3	Repair or replace damaged wells.	No
Operation	Degradation of groundwater quality resulting from an oil spill in sensitive aquifers (see Table 3-1).	GW-1, GW-2, GW-3, GW-4, SS-1, SS-2, SS-3, SS-5, SS-6	Minimize the volume of oil spilled and areas affected by implementing an OSCP. Hydrogeologic investigations and repair or replacement of damaged wells will effectively mitigate impacts to individual wells. There will be some potential for long- or short-term unmitigable impacts to affected aquifers; system safety measures will reduce the overall risk of contamination.	Yes
Surface Water				
Construction	None	NA	NA	NA
Operation	Major oil spills or leaks would degrade water quality below federal and state standards and affect downstream users. Water bodied potentially affected are listed in Table 4-41.	SS-1, SS-2, SS-3, SS-4, SS-5, SS-6 (see Footnote[3])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]

REVISED TABLE 4-64 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Geology				
Construction	None	NA	NA	NA
	Potential interference with resource extraction at the proposed Milam Lignite Mine and in the vicinity of the Orchard Dome oil field.	G-4	Rerouting the pipeline will eliminate impacts.	No
Operation	Potential hazards and risks to pipeline due to slope failures in shale formation near Spring Valley and Cameron and the banks of the Leon River, Middle Yegua Creek, and Brazos River.	G-1, G-2	Identify need for realignment or specialized design.	No
Soils				
Construction[5]	None	NA	NA	NA
Operation	None	NA	NA	NA
Aquatic Biology				
Construction	Potential reduction in diversity and abundance of important fish species in important streams due to a fuel or lubricant spill (see Table 4-45 for list of streams).	AB-1	Substantially reduce the frequency of spills greater than 40 gallons reaching streams.	No
	Potential reduction in diversity and abundance of important fish species in important streams as a result of blasting (see Table 4-45 for list of streams).	AB-4	Minimize or eliminate impacts to early life stages of fish by avoiding spawning/rearing periods and reducing areas affected by blasting.	No
Operation	Potential reductions in abundance of important finfish and shellfish species in important streams and reservoirs due to a major oil spill (see Table 4-45 for list of streams and reservoirs).	SS-1, SS-2, SS-3, SS-4, SS-6, AB-2, AB-3 (see Footnotes[3,6])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]
	Potential reductions in abundance of important finfish and shellfish species in Galveston Bay and Gulf coast near Freeport due to a major oil spill into streams without downstream reservoirs.	SS-1, SS-2, SS-3, SS-4, SS-6, AB-2, AB-3 (see Footnotes[3,6])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]

REVISED TABLE 4-64 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Terrestrial Biology Construction	Loss of approximately 121 acres of of riparian habitat mainly along the major river bottomlands in Austin, Fort Bend, and Brazoria Counties.	TB-1	Minimize disturbance and loss of riparian vegetation. Provide long-term replacement of riparian habitat lost from pipeline construction.	No
	Possible spread of oak wilt disease to disease-free areas along the ROW from Brown to Austin Counties.	TB-7	Reduce the potential for spreading oak wilt disease.	No
	Possible loss of individuals or habitat removal for three federal and/or state sensitive plant species (Texas windmill grass in Brazoria County, smooth blue star in Galveston County, and coastal gayfeather in Galveston County) and five natural plant communities (three in Bell County and two in Austin County).	TB-1, TB-12	Minimize disturbance and loss to these sensitive species.	No
	Possible loss of habitat or disturbance during breeding and brood periods for the Attwater's greater prairie chicken (federal endangered) near Orchard (see Appendix E, Figure E2-6).	TB-10[6]	Minimize or avoid habitat loss or disturbance.	No
	Possible disturbance to the Concho water snake (federal endangered) habitat in Concho River.	TB-9[6]	Minimize disturbance and habitat loss.	No
	Possible disturbance to bald eagle (federal endangered) nesting south of Lake Worthington.	TB-8[6]	Reduce the risk of nest abandonment.	No
	Possible loss of individuals or habitat for federal candidate or state threatened species (see Table 3-47 for list of species and locations).	TB-1, TB-2, TB-4, TB-5, TB-6, TB-11, TB-12	Reduce loss of individuals and habitat.	No
Operation	Potential reductions in abundance of waterfowl, marsh birds, and aquatic mammals (i.e., beaver, muskrat, nutria) in downstream rivers, reservoirs, and coastal areas (Galveston Bay and near Freeport) due to a major oil spill.	SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, TB-5, TB-13 (see Footnote[3])	Minimize the volume of an oil spill, areas affected, and effects on sensitive species by implementation of these measures.	Yes[4]

REVISED TABLE 4-64 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Terrestrial Biology (Continued)				
Operation (Continued)	Potential direct or indirect effects of a major oil spill on federal and/or state listed species (see Table 3-47 for list of species and location).	SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, TB-5, TB-13 (see Footnotes [3,6])	Minimize the volume of an oil spill, areas affected, and effects on sensitive species by implementation of these measures.	Yes[4]
Cultural Resources				
Construction	Potential disturbance to 6 known historic or prehistoric sites, plus an indeterminate number of unrecorded sites, within the construction corridor.	CR-1	Cultural resource compliance plan will ensure that adverse impacts are avoided or minimized.	Yes
Operation	Potential impacts to 36 known or prehistoric sites, plus an indeterminate number of unrecorded sites, due to increased accessibility along the route.	CR-1	Cultural resource compliance plan will ensure that adverse impacts are avoided or minimized.	Yes
Paleontology				
Construction	Potential disturbance to the following areas: Cook Mountain, Oakville, Fleming, Beaumont, Glen Rose, Fort Terrett, and Eagle Ford Group Formations; and Pleistocene Terraces at the South Concho, Pecan, Colorado, Leon, Little, East and Middle Yegua, West Fork Mill, Tepee Draw, Middle and East Kickapoo, Panther, Cowhouse, Big Elm, and Brazos stream crossings.	P-1	Avoid or minimize adverse impacts by implementing an inventory/monitoring plan.	Yes
Operation	None	NA	NA	NA
Air Quality				
Construction	None	NA	NA	NA
Operation	None	NA	NA	NA
Land Use and Recreation				
Construction	Potential loss of managed exotic and native big game species as a result of fence cuttings and open trenches.	LU-3	Minimize financial loss to ranchers.	No
Operation	Potential effect on recreational activities in downstream rivers and reservoirs and coastal areas (see Table 4-32 for list of water bodies and uses).	SS-1, SS-2, SS-3, SS-4, SS-6 (see Footnote[3])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]

REVISED TABLE 4-64 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Socioeconomics				
Construction	None	NA	NA	NA
Operation	Increase in local tax bases of approximately 10 percent.	None	NA	Yes
Transportation				
Construction	None	NA	NA	NA
Operation	None	NA	NA	NA
Visual Resources				
Construction	None	NA	NA	NA
Operation	None	NA	NA	NA
Noise				
Construction[7]	Construction noise would exceed 65 dBA at urban residences along the ROW in Pleak, Manvel, Alvin, and two urban developments 3 to 4 miles west of Webster; also at an unspecified number of farm, ranch, and rural non-farm residences.	None	NA	Yes
Operation	Operation noise from pump/heater station 4, 5, and 6 would exceed 65 dBA at nearby residences.	N-1	The 1,500-ft separation would be sufficient to reduce noise levels below 65 dBA.	No
Abandonment	If the entire pipeline were salvaged, noise impacts would be similar to the construction phase.	None	NA	Yes

[1]NA = Not Applicable.

[2]Oil spills could cause significant impacts to various resources depending upon the size and location of the spill. Specific mitigation measures for oil spill impacts to sensitive resources are provided in appropriate sections.

[3]Use of these mitigation measures would substantially reduce the oil spill risk.

[4]Level of significance would depend upon the volume of the spill, time of year, physical characteristics of the stream, and sensitivity of important organisms present.

[5]Although construction activities would accelerate soil erosion and deposition and decrease productivity in certain areas, no significant impacts would occur with the implementation of sound mechanical erosion control and revegetation techniques.

[6]Measures to avoid impacts to federal listed species are considered conservation measures.

[7]Because of short duration of impacts, limitation to daytime hours for construction, and low probability of accomplishing effective mitigation for the noise of mobile construction activity, mitigation beyond standard use of equipment mufflers and similar OSHA requirements is not considered to be warranted.

REVISED TABLE 4-65

IMPACT SUMMARY FOR THE SOUTHERN ALTERNATIVE

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
System Safety and Reliability				
Construction	None	NA[1]	NA	NA
Operation	The spill frequency rate would be 4.017×10^{-4} spills per mile-year. The expected number of spills in 40 years would be 8.6. The average spill volume would be 3,750 barrels.[2]	SS-1, SS-2, SS-3 SS-4, SS-5, SS-6, SS-8, SS-9	Minimize the volume of an oil spill. Implementation of these measures will not reduce the spill frequency rate. The expected number of spills in 40 years will be 8.6. The average spill volume will be 3,350 barrels.	Yes[2]
Groundwater				
Construction	Groundwater quality degradation resulting from cathodic protection deep-well ground beds.	GW-2	Proper construction standards will eliminate impacts.	No
	Damage to wells from blasting.	GW-3	Repair or replace damaged wells.	No
Operation	Potential degradation of groundwater quality resulting in the event of oil spill in sensitive aquifers (see Table 3-1).	GW-1, GW-2, GW-3, GS-4, SS-1, SS-2, SS-3, SS-5, SS-6	Minimize the volume of oil spilled and areas affected by implementing an OSCP. Hydrogeologic investigations and repair or replacement of damaged wells will effectively mitigate impacts to individual wells. There will be some potential for long- or short-term unmitigable impacts to affected aquifers; system safety measures will reduce the overall risk by contamination.	Yes
Surface Water				
Construction	None	NA	NA	NA
Operation	Major oil spills or leaks would degrade water quality below federal and state standards and affect downstream users. Water bodies potentially affected are listed in Table 4-53.	SS-1, SS-2, SS-3, SS-4, SS-5, SS-6 (see Footnote[3])	Minimize the volume of an oil spill and areas affected by implementation of the measures.	Yes[4]

REVISED TABLE 4-65 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Geology				
Construction	None	NA	NA	NA
Operation	Potential hazards and risks to pipeline due to slope failures at the following river crossings: Devil's, Dry Devil's, Frio, Sabinal, Guadalupe, Colorado, West Bernard, San Bernard, and Brazos.	G-1, G-2	Identify need for realignment or specialized design.	No
Soils				
Construction[5]	None	NA	NA	NA
Operation	None	NA	NA	NA
Aquatic Biology				
Construction	Potential reduction in diversity and abundance of important fish species in important water bodies due to a fuel or lubricant spill (see Table 4-57 for list of water bodies).	AB-1	Substantially reduce the frequency of spills greater than 40 gallons reaching streams.	No
	Potential reduction in diversity and abundance of important fish species in important streams as a result of blasting (see Table 4-57 for a list of streams).	AB-4	Miminize or eliminate impacts to early life stages of fish by avoiding spawning/rearing periods and reducing areas affected by blasting.	No
Operation	Potential reductions in diversity and abundance of important fish species in important streams and reservoirs due to a major oil spill (see Table 4-57 for list of streams and reservoirs).	SS-1, SS-2, SS-3, SS-4, SS-6, AB-2, AB-3 (see Footnotes [3,6])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]
	Potential reductions in abundance of important finfish and shellfish species in Galveston Bay, Matagorda Bay, Gulf coast near Freeport, and San Antonio Bay due to a major oil spill into stream without downstream reservoirs.	SS-1, SS-2, SS-3, SS-4, SS-6, AB-2, AB-3 (see Footnotes [3,6])	Minimize the volume of an oil oil spill and areas affected by implementation of these measures.	Yes[4]
Terrestrial Biology				
Construction	Loss of approximately 260 acres of of riparian habitat mainly along the major river bottomlands in Wharton, Fort Bend, and Brazoria Counties.	TB-1	Minimize disturbance and loss of riparian vegetation. Provide long-term replacement of riparian habitat lost from pipeline construction.	No

REVISED TABLE 4-65 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Terrestrial Biology (Continued)				
Construction (Continued)	Possible spread of oak wilt disease to disease-free areas along the ROW from Uvalde to Lavaca Counties.	TB-7	Reduce the potential for spreading oak wilt disease.	No
	Potential loss of Texas snowbells (federal endangered) population/ habitat (Crockett, Val Verde, and Edwards County).	TB-14[6]	Reduce loss of individuals and habitat.	Yes
	Possible loss of individuals or habitat removal for five federal and/or state sensitive species: Jones' selenia (Crockett County); Elmendorf onion (Wilson County); Texas windmill grass (Brazoria County), smooth blue star (Galveston County), and coastal gayfeather (Galveston County).	TB-1, TB-12	Minimize disturbance and loss of habitat to these sensitive species.	No
	Possible loss or disturbance during the breeding and brood periods for the Attwater's greater prairie chicken (federal endangered) in Galveston County (see Appendix E, Figure E2-6).	TB-10[6]	Minimize or avoid habitat loss or disturbance.	No
	Possible disturbance to bald eagle nesting south of Lake Worthington.	TB-8[6]	Reduce the risk of nest abandonment.	No
	Possible loss of individuals or habitat for federal candidate or state threatened species (see Table 3-66 for list of species and locations).	TB-1, TB-2, TB-4, TB-5, TB-6, TB-11, TB-12	Reduce loss of individuals and habitat.	No
Operation	Potential reductions in abundance of waterfowl, marsh birds, and aquatic mammals (i.e., beaver, muskrat, nutria) in downstream rivers, reservoirs, and coastal areas (Galveston, Matagorda, and San Antonio Bays and near Freeport) due to a major oil spill.	SS-1, SS-2, SS-3, SS-4, SS-6, TB-5, TB-13 (see Footnote[3])	Minimize the volume of an oil spill, areas affected, and effects on sensitive species by implementation of these measures.	Yes[4]

REVISED TABLE 4-65 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Terrestrial Biology (Continued)				
Operation (Continued)	Potential direct or indirect effects of a major oil spill on federal and/or state listed species (see Table 3-66 for list of species and location).	SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, TB-5, TB-13 (see Footnotes [3,6])	Minimize the volume of an oil spill, areas affected, and effects on sensitive species by implementation of these measures.	Yes[4]
Cultural Resources				
Construction	Potential disturbance to 35 known or prehistoric sites, plus an indeterminate number of unrecorded sites, within the construction corridor.	CR-1	Cultural resource compliance plan will ensure that adverse impacts are avoided or minimized.	Yes
Operation	Potential impacts to 28 known historic or prehistoric sites, plus an indeterminate number of unrecorded sites, due to increased accessibility along the route.	CR-1	Cultural resource compliance plan will ensure that adverse impacts are avoided or minimized.	Yes
Paleontology				
Construction	Potential disturbance to the following areas: Cook Mountain, Oakville, Fleming, Goliad, and Beaumont Formations; caves on the Edwards Plateau; and Pleistocene Terraces at the Nueces, Leona, Cooks Slough, Frio, Sabinal, Hondo, San Francisco Perez, Chacon, San Antonio, Cibolo, Guadalupe, East Fork Sycamore, Flat Rock, Sandy, Lavaca, and Navidad stream crossings.	P-1	Avoid or minimize adverse impacts by implementing an inventory/monitoring plan.	Yes
Operation	None	NA	NA	NA
Air Quality				
Construction	None	NA	NA	NA
Operation	None	NA	NA	NA
Land Use and Recreation				
Construction	Potential loss of managed exotic and big game species as a result of fence cutting and open trenches.	LU-3	Minimize financial loss to ranchers.	No
Operation	Potential effects on recreational activities in downstream rivers and reservoirs and coastal areas (see Table 4-32 for list of water bodies and uses).	SS-1, SS-2, SS-3, SS-4, SS-6 (see Footnote [3])	Minimize the volume of an oil spill and areas affected by implementation of these measures.	Yes[4]

REVISED TABLE 4-65 (CONTINUED)

Resource	Significant Impacts	Mitigation Measure (see Section 4.7)	Effectiveness	Impact Still Significant
Socioeconomics				
Construction	None	NA	NA	NA
Operation	Increase in local tax bases of approximately 12 percent.	None	NA	Yes
Transportation				
Construction	None	NA	NA	NA
Operation	None	NA	NA	NA
Visual Resources				
Construction	None	NA	NA	NA
Operation	None	NA	NA	NA
Noise				
Construction[7]	Construction noise would exceed 65 dBA at urban residences along the ROW in Brackettville, Needville, Uvalde, Devine, and Floresville; and at numerous farm, ranch, and rural non-farm residences.	None	NA	Yes
Operation	Operation noise from pump/heater stations 4 and 6 would exceed 65 dBA at nearby residences.	N-1	The 1,500-ft separation will be sufficient to reduce noise levels below 65 dBA.	No
Abandonment	If the entire pipeline were salvaged, noise impacts would be similar to the construction phase.	None	NA	Yes

[1]NA = Not Applicable.

[2]Oil spills could cause significant impacts to various resources depending upon the size and location of the spill. Specific mitigation measures for oil spill impacts to sensitive resources are provided in appropriate sections.

[3]Use of these mitigation measures would substantially reduce the oil spill risk.

[4]Level of significance would depend upon the volume of the spill, time of year, physical characteristics of the stream, and sensitivity of important organisms present.

[5]Although construction activities would accelerate soil erosion and deposition and decrease productivity in certain areas, no significant impacts would occur with the implementation of sound mechanical erosion control and revegetation techniques.

[6]Measures to avoid impacts to federal listed species are considered conservation measures.

[7]Because of short duration of impacts, limitation to daytime hours for construction, and low probability of accomplishing effective mitigation for the noise of mobile construction activity, mitigation beyond standard use of equipment mufflers and similar OSHA requirements is not considered to be warranted.

APPENDIX B - ONION CREEK TO EDWARDS AQUIFER OIL SPILL SCENARIO

APPENDIX B

ONION CREEK TO EDWARDS AQUIFER
OIL SPILL SCENARIO

1.0 INTRODUCTION

A catastrophic oil spill scenario occurring near Onion Creek and affecting the Edwards Aquifer recharge zone is presented in this appendix. Many assumptions were employed to produce hypothetical damage to the aquifer. Assumptions used for this scenario are presented in Section 2.0. The actual scenario is presented in Section 3.0 of this appendix. While this scenario is a plausible one, the reader should bear in mind that the likelihood of all assumptions occurring simultaneously is extremely low (once in 8,900 years).

Assumptions pertaining to the spill event were designed to produce a plausible catastrophic spill which had the potential to reach Onion Creek and affect the Edwards Aquifer. Crude composition, volatilization, and solubility assumptions were drawn from published literature sources. Assumptions concerning the hydrology of Onion Creek and its role in recharging the Edwards Aquifer reflect observations made by Raymond Slade of the Texas District of the United States Geological Survey, Water Resources Division.

2.0 ASSUMPTIONS FOR SPILL EVENT

1. Pipe is completely severed (Marmac 1985b).

2. Pipeline flow is at its maximum rate (450,000 BPD).

3. Crude flowing in pipeline is West Texas Intermediate (WTI).

4. Pipeline operating pressure is 675 psig (Marmac 1985a).

5. Pipeline operating temperature is 80°F and pipeline does not require heating to transport West Texas Intermediate crude.

6. Air temperature is 78°F.

7. Time of rupture: 5:00 p.m., weekend, spring of year 2001 A.D.

8. Rupture takes place (see Map B-1) within the Edwards Aquifer recharge zone close to Onion Creek (0.5 mile or 2,640 ft from Onion Creek). This location was selected after considering ruptures at 15 possible locations along the pipeline. Spill volumes, overland flow rates for crude, and distance to Onion Creek were generated by Marmac (1985b) from an engineering model of the pipeline. The model considered such things as block and check valve locations and shutdown time to give realistic maximum spill volumes for various locations along the pipeline. The spill location was chosen based on proximity to Onion Creek, as well as spill size, cleanup crew response time, etc., and it was felt that a spill at this location would have the greatest probability of reaching Onion Creek and affecting the Edwards Aquifer.

9. Spill size calculated by Marmac (1985b) for this location is 3,230 barrels (135,660 gallons). Refer to Modifications and Corrections section for page 4-20 for a description of these calculations.

10. Spill takes place 15 minutes prior to the beginning of a 1.0-inch rainfall event (Slade et al. 1986). Onion Creek is assumed to be dry prior to the rain storm.

11. The probability of a rupture occurring along a one-half mile stretch of pipeline which could affect Onion Creek is estimated to be once in 8,900 years.

12. There is a one in three chance of rain on any given day in the Austin area (Slade, personal communication 1987).

13. Assuming that a spill cleanup will take at least 3 days, the probability of a rupture in the pipeline followed by a rain event before cleanup is complete is once in 8,900 years.

2.1 Assumptions for Properties of WTI Crude

1. More detailed breakdown for WTI (from Bland and Davidson 1967) is:

Fraction	Number Carbons	Average Weight (%)	Mean API
LPGs and NGLs	$<C_7$	2.05	
Gasoline and Naptha	C_7 - C_8	33.05	58.5
Kerosine Distillate	C_{10} - C_{16}	10.45	43.3
Gas Oil Distillate	C_{16} - C_{30}	15.38	35.4
Lubricating Distillate	C_{30} - C_{50}	15.25	28.7
Residium	C_{80}+	23.82	17.0

2. Assume C_{10} - C_{16} fractions equally comprise the 10.45 percent kerosine distillate fractions.

3. A weighted average for °API Gravity calculated from values in assumption 1 is:

(35.1%)	x	58.5	=	20.53
(10.45%)	x	43.3	=	4.52
(15.38%)	x	35.4	=	5.44
(15.25%)	x	28.7	=	4.37
(23.82%)	x	17.0	=	4.05
				38.91

4. Assume a kinematic viscosity @ 68°F, based on °API Gravity of 38.91, of 16.73 centistakes; then the WTI crude at 68°F would be 16.73 times more viscous than water at 68°F.

2.2 Assumptions for Volatilization

1. Assume no loss by volatilization for compounds greater than C_{16}; then 54.45 percent would not be affected by volatilization (Adland 1979).

2. Assume complete volatilization of compounds C_6 or lighter; then 2.05 percent would completely volatilize.

3. Assume weathering under extreme conditions of compounds C_{10} - C_{16} in WTI will follow that of Kuwait crude oil; then volatilization rates would be:

	Time in Hours							
	1	2	3	6	12	24	48	96
C_{16}	0.2%	0.3%	0.5%	1%	2%	2%	6%	8%
C_{14}	2%	3%	4%	12%	19%	29%	54%	73%
C_{12}	21%	25%	36%	57%	74%	89%	98%	100%
C_{11}	44%	48%	60%	86%	94%	99%	100%	100%
C_{10}	30%	61%	77%	96%	100%	100%	100%	100%

Extrapolated from Adlard 1979, Figure 1.

4. Assume the same volatilization rates for C_7 - C_8 for C_{10} (rates should actually be somewhat higher).

5. Assume that volatilization of WTI crude over 24 hours corresponds to volatilization rates for crude exposed to extreme conditions over 2 hours, then:

   (100% of C_6 and lower) x 2.05% crude = 2.05%

   (30.5% of C_7 and C_8) x 33.05% crude = 5.04%

   (30.5% of C_{10}) x $(\frac{10.45\%}{5})$ crude = 0.32%

   (24% of C_{11}) x $(\frac{10.45\%}{5})$ crude = 0.25%

   (12.5% of C_{12}) x $(\frac{10.45\%}{5})$ crude = 0.13%

   (1.5% of C_{14}) x $(\frac{10.45\%}{5})$ crude = 0.015%

   (0.15% of C_{16}) x $(\frac{10.45\%}{5})$ crude = 0.0015%

Total Volatilization = 7.8%

6. Total Volatilization = (3,230 barrels) x (7.8%) = 252 barrels

   (252 barrels) x $(\frac{42 \text{ gallons}}{\text{barrel}})$ = 10,584 gallons

2.3 <u>Assumptions for Solubility</u>

1. Assume C_{20} and higher are insoluble, then 50.35 percent of crude is insoluble (Adlard 1979) and assume 7.8 percent is lost through volatilization; then the remaining 41.85 percent is available for dissolution in water.

2. Total crude available for dissolution:

$(41.58\%) \times (3{,}230 \text{ barrels}) = 1{,}351.7 \text{ barrels}$

$(1{,}351.7 \text{ barrels}) \times (\frac{42 \text{ gallons}}{\text{barrels}}) = 56{,}771 \text{ gallons}$

$(56{,}771 \text{ gallons}) \times (\frac{3{,}785.4\text{cc}}{\text{gallon}}) = 2.14900943 \times 10^8\text{cc}$

3. Assume °API Gravity = 38.91, and Specific Gravity = 0.83, and density (P_0) = 0.83 gm/cc; then:

$(2.14900943 \times 10^8\text{cc}) \times (0.83 \text{ gm/cc}) = 1.78367782 \times 10^8\text{gm}$
$= 1.78367782 \times 10^{11}\text{mg}$

available for dissolution.

4. Assume the soluble fractions (C_7 - C_{16}), which include gasoline, have solubilities ranging from 20 to 80 mg/l (Freeze and Cherry 1979), and that for this scenario the solubility is 50 mg/l (ppm).

2.4 Assumptions for Topography and Hydrology

1. Assume spill covers 3 acres, prior to rain storm.

2. Gradient along swale measured at 70 to 100 ft/2,640 ft which gives 2.6 to 3.8 percent. Assume 3 percent grade.

3. Assume overland flow rate of water at 3 percent grade for short grass pasture of 70 ft/minute (U.S. Department of Agriculture 1972).

4. Assume 1.0-inch rainfall in 2 hours.

5. Assume 175 acres of watershed comprise the swale; measured from topo maps (see Map B-1).

6. Assume 19 acres of watershed comprises sub-basin which contributes runoff that flows directly over the spill; measured from topo maps (see Map B-1).

7. Using Soil Conservation Service (SCS) Graphical method, the following total runoff volumes were calculated:

For swale, runoff = 14.58 acre ft and

$(14.58 \text{ acre ft}) \times 1.233 \times 10^6 \frac{\text{liters}}{\text{acre ft}} = 1.7977 \times 10^7 \text{ liters}$

$(14.58 \text{ acre ft}) \times 3.26 \times 10^5 \frac{\text{gallons}}{\text{acre ft}} = 4.7517 \times 10^6 \text{ gallons}$

For sub-basin, runoff = 1.58 acre ft

8. Using the SCS Graphical Method, peak discharges and times to peak were calculated, neglecting infiltration.

	Area	Peak Discharge	Time to Peak
Sub-basin	19 acres	16 cfs	8 minutes
Swale	175 acres	40 cfs	35 minutes
Onion Creek	86,200 acres	136 cfs	24 hours

9. Assume that a 1-inch rain will wash 80 percent of spilled crude down a 0.5-mile long swale and that 70 percent of spilled crude will reach Onion Creek during the storm's 2-hour duration (Young, personal communication 1987).

10. Assume 13-mile reach of Onion Creek recharges the Edwards Aquifer at a maximum rate of 120 cfs for the given scenario, and that 112 cfs of recharge occurs downstream from the scenario (Raymond Slade, USGS comments on Draft SEIS, 1986). Then the Edwards Aquifer is recharged at a maximum rate of 8 cfs along the stretch upstream of the scenario, and the aquifer recharged at a rate of 9.2 cfs per linear mile of stream.

11. Assuming a linear relationship for recharge to the aquifer, then 12.1 miles of recharge zone would lie beneath Onion Creek, downstream from the scenario, and 0.9 mile of recharge zone would lie upstream from the scenario.

12. Assume Onion Creek provides 34 percent of recharge to the Edwards recharge zone feeding Barton Springs, and volume stored in this part of the aquifer is 300,000 acre ft (Slade et al. 1986). Then 102,000 acre ft is derived from Onion Creek recharge.

13. Conversion factors:

    1 acre foot = 43,560 cubic feet = 1.233×10^6 liters

    1 barrel crude = 1.3196×10^8 mg

3.0 SPILL EVENT

At 5:00 p.m. on a Saturday afternoon in May 2001, a pipeline rupture caused by a bulldozer used in building a road results in an oil spill. The driver, who is intoxicated, leaves the scene and makes no telephone calls. The following events occur subsequent to the rupture.

Following leak detection by the pipeline leak detection system, the operator initiates pipeline shutdown. An initial 500 barrels of oil are released in the 2 minutes before the pumpline pumps can be shut down. Two additional minutes elapse prior to complete closure of the remote-control block valves surrounding the break. During this time, a skeleton crew of operators receives the warning alarm, checks for equipment failures, shuts down pumps, closes down valves, verifies event location, and initiates the oil spill contingency plan notifications.

During this initial action period, the oil coats a 3-acre area and starts to flow down a swale with a 3 percent gradient toward Onion Creek (see Map B-1 for location). The oil spill contingency plan mobilization continues. Equipment is dispatched from a yard near Kyle and will take at least 2 hours and 15 minutes to arrive at the site. Respondents are on-call and may need more time to mobilize on a weekend evening. After the pipeline pumps have been shut down and the block valves have been closed, oil continues to flow from the ruptured pipe under the force of gravity. A total of 3,230 barrels of oil spreads around the rupture site, and some oil travels down the swale in the direction of Onion Creek.

The initial wave of oil dissipates about 200 ft from the point of rupture. The low viscosity WTI oil then travels at 6 to 9 ft per minute toward Onion Creek. Unhindered, the oil would reach Onion Creek within 5 to 7.5 hours after the spill.

Fifteen minutes after the rupture, a moderate rain begins. The rain falls steadily at a rate of 0.5 inch per hour for 2 hours and then stops.

Aided by agitation from the storm, volatilization of the lightest components reduces the spill volume by a total of 7.8 percent. The bulk of the volatilization occurs during the first few hours after the spill.

Water flows down the poorly vegetated swale at a maximum rate of 70 ft per minute. Within 35 minutes of the storm's beginning (T_o), the swale experiences a peak discharge of 40 cubic ft per second (cfs). The peak discharge is maintained in the swale for one hour and 25 minutes (T_o + 2 hours) and then diminishes to no flow at T_o + 3.05 hours (see Figure C-2). Although some of the oil clings to the sides of the swale, most is washed down the swale toward Onion Creek. The more soluble compounds become dissolved in the runoff.

Assuming dissolved and floating oil constituents move with the same velocity as the overland flow, oil and water reach Onion Creek as the swale discharge peaks at time = T_o + 35 minutes and continues to enter

Onion Creek until flow in the swale stops. Some water with undetermined concentrations of dissolved constituents has infiltrated the shallow subsurface along the length of the swale.

Based on comments from Raymond Slade (USGS) and Figure B-2, at the time the first drop of oil from the swale enters Onion Creek (T_o + 35 minutes), total flow in the creek at the mouth of the swale is approximately 43 cfs (see Figure B-2). Since this stretch of creek recharges the aquifer at a rate of 9.2 cfs per linear mile, the above mentioned 43 cfs of water and oil would travel 4.7 miles before being completely recharged to the aquifer. Assuming a stream velocity of 1.8 feet per second (1.3 mph), the first oil and water entering Onion Creek at the mouth of the swale would be completely lost to the aquifer within 3.6 hours after its entrance to Onion Creek (time = T_o + 4.2 hours).

At time T = T_o + 2 hours, total discharge at the mouth of the swale (oil and water) is approximately 50 cfs (see Figure B-2). Taking a snapshot in time, this 50 cfs of oil and water would travel 5.4 miles before being completely recharged to the aquifer. Still assuming a stream velocity of 1.3 mph, this oil and water would be lost to the aquifer within 4.2 hours after its entrance to Onion Creek at the mouth of the swale (T = T_o + 6.2 hours)

The last oil to discharge into Onion Creek enters the creek at Time = T_o + 3.05 hours. The discharge at the mouth of the swale has decreased to 15.5 cfs (see Figure B-2). This 15.5 cfs will be completely discharged to the aquifer over a distance of 1.7 miles. This last 15.5 cfs of oil and water will be lost to the aquifer within 1.3 hours after its discharge into Onion Creek (T = T_o + 4.4 hours).

The spill cleanup team, delayed by weather and muddy unimproved roads, arrives at the rupture site 3.5 hours after the spill incident (T = T_o + 3.25 hours). By this time the rain has stopped and there is no flow in the swale. Eighty percent of the spilled crude (2,584 barrels) has been washed from the rupture point into the swale, with 70 percent (2,261 barrels) having reached Onion Creek (Young, personal communication 1987).

Part of the crew begins cleanup at the spill site, while the remaining members begin a site reconnaissance. Oil clinging to the sides of the swale is mopped up with absorbent material. A trench near the mouth of the swale is constructed to collect oil moving in the first 6 to 8 ft of the subsurface.

The reconnaissance team, still hindered by locked gates, dusk, and slippery terrain finds it difficult to ascertain the extent of the oil plume in Onion Creek. Since the creek bed is comprised of slick limestone, stream velocity is relatively constant across the stream. The oil plume also moves with a relatively constant velocity and is not greatly dispersed as it travels downstream (Slade, personal communication 1987). A small fraction (say 10 percent) of the oil clings to the banks of Onion Creek.

Forty-five minutes after the cleanup crew arrives onsite ($T = T_o$ + 4 hours), the leading edge of the plume is 4.4 miles downstream of the swale while the trailing edge of the plume is 1.7 miles downstream of the swale. Two hours later ($T = T_o$ + 6 hours) when the vacuum trucks and skimmers arrive on site, all of the water discharged from the swale to Onion Creek and most of the crude oil carried by the water has already been recharged to the Edwards Aquifer, within a distance of 5.4 miles downstream of the swale (Slade, personal communication 1987).

In the ensuing hours, the crew continues mopping up operations. Recovery efforts continue for three weeks as oil is mopped up from the swale and the banks of Onion Creek. Heavy equipment removes the top layer of oil-soaked material at the ground surface in the spill area. Clean soil is brought in, and the ground surface is landfarmed. Some crude is recovered from the interception trench.

The crude loss is summarized as follows:

- 252 barrels lost to volatilization.
- Of 2,261 barrels introduced into Onion Creek, 2,035 barrels recharged directly into the aquifer and 226 barrels lost to the banks of Onion Creek.
- Of 717 barrels remaining near the rupture site or in the swale, 358 barrels (50 percent) recovered from trench or mop up operations, and 359 barrels lost to the vadose zone.

In conclusion, this spill could have the following impacts:

- A total of 2,035 barrels of crude would penetrate the Edwards Aquifer, 874 barrels of which would consist of soluble compounds. EPA Emergency Response Team experience (Jones 1987) has shown that typically 10 percent of total crude spilled will go into solution in water, even though up to 40 percent of the crude consists of soluble components. This difference occurs because crude constituents are basically hydrophobic and prefer to remain bound in the crude rather than to become dissolved in water. (Please refer to Appendix A, Section 1.1 in the Modifications and Corrections Section of the FSEIS for a more detailed discussion). In this case, an estimated 323 barrels would most likely go into solution.

  Assuming that between 323 and 874 barrels of soluble crude are dissolved in the groundwater, this quantity of soluble material is enough to pollute between 692 and 1,874 acre feet of the aquifer to a maximum solubility concentration of 50 mg/l or to pollute the volume of the aquifer which is derived from the recharge zone of Onion Creek (102,000 acre feet) to a concentration between 0.34 and 0.91 mg/l. In comparison, the taste and odor threshold for crude is 0.1 to 0.5 mg/l (Ineson and Packham 1967).

A contaminant plume, initially concentrated in the vicinity of the penetrated creek bed of Onion Creek, would move downgradient with a concentration possibly falling between 0.34 and 50 mg/l. Points close to the source would have higher concentrations, while points near the edges would have lower concentrations.

- Some wells near Onion Creek, such as the Buda municipal wells, most likely would be affected adversely by the contaminant plume. The maximum concentration in the Buda area would be less than 50 mg/l. Because of the dispersion characteristics of the Edwards recharge zone (Slade, personal communication 1987), an initial peak of contamination would pass through the Buda area, followed by decreasing levels of contamination drawn out over some period of time. Water in the Buda wells probably would be unuseable, unless treated, for some period of time. Testing and treating of water would be required until tests showed that no adverse concentrations of contamination were present. An alternate water supply could be required (see Appendix A Section 1.4 of Modifications and Corrections section of FEIS for health effects discussion).

- Soluble components of the crude lost to the subsurface in the immediate vicinity of the spill could be released slowly to the Edwards Aquifer with subsequent rains. The amount of crude released to the Edwards Aquifer would be dependent upon the characteristics of a given storm event.

- Crude lost to the banks of Onion Creek or downstream of the recharge zone most likely would be carried downstream in subsequent stream flow to the Colorado River. The crude probably would be released in dilute quantities over time and would not produce noticeable deleterious effects.

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Young, B. EPA Emergency Response Branch - Region VIII. 1987. Personal communication with Christine Renda, ERT.

APPENDIX C - ENDANGERED SPECIES CONSULTATION

1792 (ALC)

IN REPLY REFER TO:

(CA-063.14)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
CALIFORNIA STATE OFFICE
2800 Cottage Way
Sacramento, California 95825

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FEB 9 1987

Michael J. Spear
Director, Region 2
U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, New Mexico 87103

Dear Mr. Spear:

Pursuant to section 7 of the Endangered Species Act, the Bureau would like to initiate formal consultation on several species which may be affected by the Proposed All American Pipeline Project from McCamey to Galveston Bay, Texas. We have enclosed four copies of the Biological Assessment for this project. We have sent separately the supplemental Environmental Impact Statement for this project; however, the Biological Assessment contains a detailed description of the project in Appendix A.

We have determined that the following listed species may be adversely affected by the proposed project and hereby request formal consultation on these species as required by 50 CFR 402.14(a):

Concho water snake (Nerodia harteri paucimaculata) - threatened
Bald eagle (Haliaeetus leucocephalus) - endangered, threatened
Attwater's prairie chicken (Tympanuchus cupido attwaterii - endangered
Texas snowbells (Styrax texana) - endangered
Tobusch fishhook cactus (Ancistrocactus tobuschii) - endangered

We have determined that there may be an adverse affect on the black-capped vireo (Vireo atricapillus), which is a category 1 candidate, and hereby request technical advice on this species, since it is likely that it will be officially listed prior to completion of this project. Section 5 of the Biological Assessment also addresses the occurrence of other candidate species within the action area.

Several other listed species occurring in the action area have been analyzed in the Biological Assessment. For these we have made a determination that the project is not likely to have an adverse affect, and, therefore, consultation is not required (50 CFR 402.14(b)(I)). Please provide written concurrence if you do concur with this determination. Mitigation measures are presented in the Biological Assessment for these species, and your comment on these measures would be appreciated.

Sincerely,

Ed Hastey

Ed Hastey
State Director

cc: DM, CDD

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
CALIFORNIA STATE OFFICE
2800 Cottage Way
Sacramento, California 95825

RECEIVED
BUREAU OF LAND MANAGEMENT
1987 MAY -7 PM 1:16
CALIF. DESERT DISTRICT
RIVERSIDE, CA.

IN REPLY REFER TO:

~~6840~~
CA-932.51

1792 (ALL)
5/7/87

MAY 5 1987

Michael J. Spear
Director, Region 2
U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, NM 87103

Dear Mr. Spear:

This is in response to your letter of April 20, 1987, requesting a 60-day extension for our ongoing formal section 7 consultation concerning the All American Pipeline (No. 2-13-86-F-81). We hereby concur with that extension.

Sincerely,

Ed Hastey

Ed Hastey
State Director

cc:
Bill Haigh, CDD

United States Department of the Interior

FISH AND WILDLIFE SERVICE
POST OFFICE BOX 1306
ALBUQUERQUE, N.M. 87103

TAKE PRIDE IN AMERICA

In Reply Refer To:
Region 2/FWE

Consultation No. 2-13-86-F-81

MAR 23 1987

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MEMORANDUM

TO: State Director, Bureau of Land Management, Sacramento, CA
Assistant

FROM: Regional Director, Region 2 (FWE)

SUBJECT: Formal Section 7 Consultation - All American Pipeline

This acknowledges receipt of your request dated February 9, 1987 to initiate formal Section 7 consultation for the proposed All American Pipeline Project as required by the Endangered Species Act (ESA) of 1973, as amended. Your request and the project biological assessment were received February 12, 1987, the date this consultation was initiated.

Your January 1987 biological assessment and draft supplemental environmental impact statement concludes, and we agree, the Concho water snake (Nerodia harteri paucimaculata), bald eagle (Haliaeetus leucocephalis), Attwater's prairie chicken (Tympanuchus cupido attwaterii), Texas wild rice (Zizania texana), fountain darter (Etheostome fonticola), San Marcos gambusia (Gambusia georgei), Sam Marcos salamander (Eurycea nana), and Texas blind salamander (Typhlomolge rathbuni) may be impacted as a result of the project. We also concur with your biological assessment that further surveys will have to be conducted on the Texas snowbells (Styrax texana), Tobusch fishhook cactus (Ancistrocactus tobuschii), and Houston toad (Bufo houstonensis) before a "may affect" determination can be made. Until that determination is made, these species are not eligible for formal consultation.

We do not believe the following species will be impacted: peregrine falcon (Falco peregrinus), whooping crane (Grus americana), brown pelican (Pelecanus occidentalis), eskimo curlew (Numenius borealis), interior least tern (Sterna antillarum), jaguarundi (Felis yagouaroundi cacomitli), ocelot (Felis pardalis), and sea turtles using coastal beaches and waterways. The American alligator (Alligator mississippinensis) is not covered by Section 7 of the ESA. The impact of the project on the proposed endangered black-capped vireo (Vireo attricapillus) remains to be determined. If other species are impacted as a result of your action, you will have to initiate formal consultation for those species.

To assist our evaluation, we need to know when you estimate construction will occur in the area occupied by the Concho water snake. We look forward to continued coordination in this matter.

cc:
District Manager, Bureau of Land Management, Riverside, CA
(Attn: Bill Haigh)

Larry Foreman

1792 (ALL)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
POST OFFICE BOX 1306
ALBUQUERQUE, N.M. 87103

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APR 20 1987

MEMORANDUM

To: State Director, Bureau of Land Management, Sacramento, CA

From: Regional Director, Region 2 (FWE)

Subject: Request for an Extension of Time, Formal Section 7 Consultation, All-American Pipeline (Consultation No. 2-13-86-F-81)

The U.S. Fish and Wildlife Service (FWS) requests a 60-day extension of time for the submission of the biological opinion on the All-American Pipeline. As per the April 6, 1987, phone conversation with Larry Foreman of your office and our Clear Lake Ecological Services Office, the biological opinion due date is mutually extended to July 13, 1987.

If possible, we will deliver the biological opinion before that date, however, this will depend on the timely availability of essential information as requested in our April 2, 1987, memo. Some "Field Clearance Surveys" are complete, but information has not been forwarded to FWS. In other instances, Field Clearance Surveys will not be conducted until April (Concho water snake, Houston toad) and May (Texas snowbells, black-capped vireo).

Information supplied to us by June 13, 1987, will be incorporated into the biological opinion. Any information gaps that remain will be evaluated using worst case assumptions.

We appreciate your cooperation on this matter and request your written concurrence on this extension. Please contact Mike Morgan of our Clear Lake Office at FTS 526-7682 or (713) 229-3682 for any questions about our information request.

cc:
District Manager, California Desert District, BLM, Riverside, CA

United States Department of the Interior

FISH AND WILDLIFE SERVICE
POST OFFICE BOX 1306
ALBUQUERQUE, N.M. 87103

TAKE PRIDE IN AMERICA

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Ret

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In Reply Refer To:
Region 2/FWE

AUG 21 1987

2-01-87-F-03

MEMORANDUM

TO: State Director, Bureau of Land Management, Sacramento, CA

FROM: Regional Director, Fish and Wildlife Service, Region 2, Albuquerque, NM

SUBJECT: Biological Opinion for the All American Pipeline Construction and Operation in 46 Texas Counties

A letter dated February 9, 1987, from the Bureau of Land Management (Bureau) requested formal consultation with the U.S. Fish and Wildlife Service (Service) under Section 7 of the Endangered Species Act to consider impacts from the construction and operation of the All American Pipeline. This biological opinion pertains only to the 46 Texas counties listed below:

Atascosa	Austin
Bastrop	Bell
Bexar	Blanco
Brazoria	Brown
Burleson	Caldwell
Coleman	Colorado
Concho	Coryell
Crockett	DeWitt
Edwards	Falls
Fayette	Fort Bend
Galveston	Gillespie
Hamilton	Harris
Hays	Irion
Jackson	Karnes
Kimble	Kerr
Lavaca	Kinney
McLennan	Lee
Milam	Medina
Reagan	Mills
Tom Green	Sutton
Val Verde	Uvalde
Wharton	Washington
Upton	Wilson

The Service received a Biological Assessment for the proposed project on February 12, 1987. A coordinated review of the Biological Assessment was accomplished with the National Marine Fisheries Service on February 24, 1987, and a telephonic "no effect" was received for marine species on April 1, 1987.

Meetings for coordination and information exchange were conducted as follows:

March 2, 1987 - Clear Lake, Corpus Christi, and Fort Worth Ecological Services Field Offices.

March 16, 1987 - Public Meeting at Texas City, Texas.

March 19, 1987 - Environmental Research Technology, Texas Parks and Wildlife Department, Attwater's Prairie Chicken National Wildlife Refuge, and Clear Lake Field Office.

March 19, 1987 - Environmental Research Technology and the Service.

This biological opinion was due May 13, 1987, but an extension was requested by the Service and approved by the Bureau until July 13, 1987. A further extension was requested by the Service and approved by the applicant (All American Pipeline Company) in order to allow the Bureau to assess the feasibility of reasonable and prudent alternatives of the draft biological opinion. That extension expires August 21, 1987. This opinion is based on data from our files, discussions with experts on each species, and field examinations.

DESCRIPTION OF PROPOSED ACTION

The All American Pipeline Company is currently constructing a 1,247-mile, 30-inch diameter, 300,000 barrels per day (barrels), heated crude oil pipeline from Las Flores Canyon in Santa Barbara County, California, to a terminal at McCamey, Texas. A biological opinion (1-RO-84-F-62) for that pipeline segment was issued on November 23, 1984, by the Service's Portland, Oregon office. An additional segment of the All American Pipeline, which is covered by this biological opinion, is proposed to transport crude oil from McCamey to interconnections with existing pipelines at Webster, Texas, and to a marine terminal in Texas City, Texas. Three alternative routes are under consideration for the portion of the proposed pipeline east of McCamey, Texas (Figure 1).

Table 1 summarizes the components and facilities of the proposed pipeline alternatives. The proposed route from McCamey to Webster and Texas City is 486 miles in length and traverses 17 counties. The proposed route would cross 66 major highways, 93 rivers and streams, and 20 railroads. The northern alternative is 546 miles long, traverses 23 counties, and would cross 69 major highways, 28 railroads, and 116 rivers and streams. The southern alternative is 538 miles long, traverses 19 counties, and would cross 58 major highways, 17 railroads, and 115 rivers and streams.

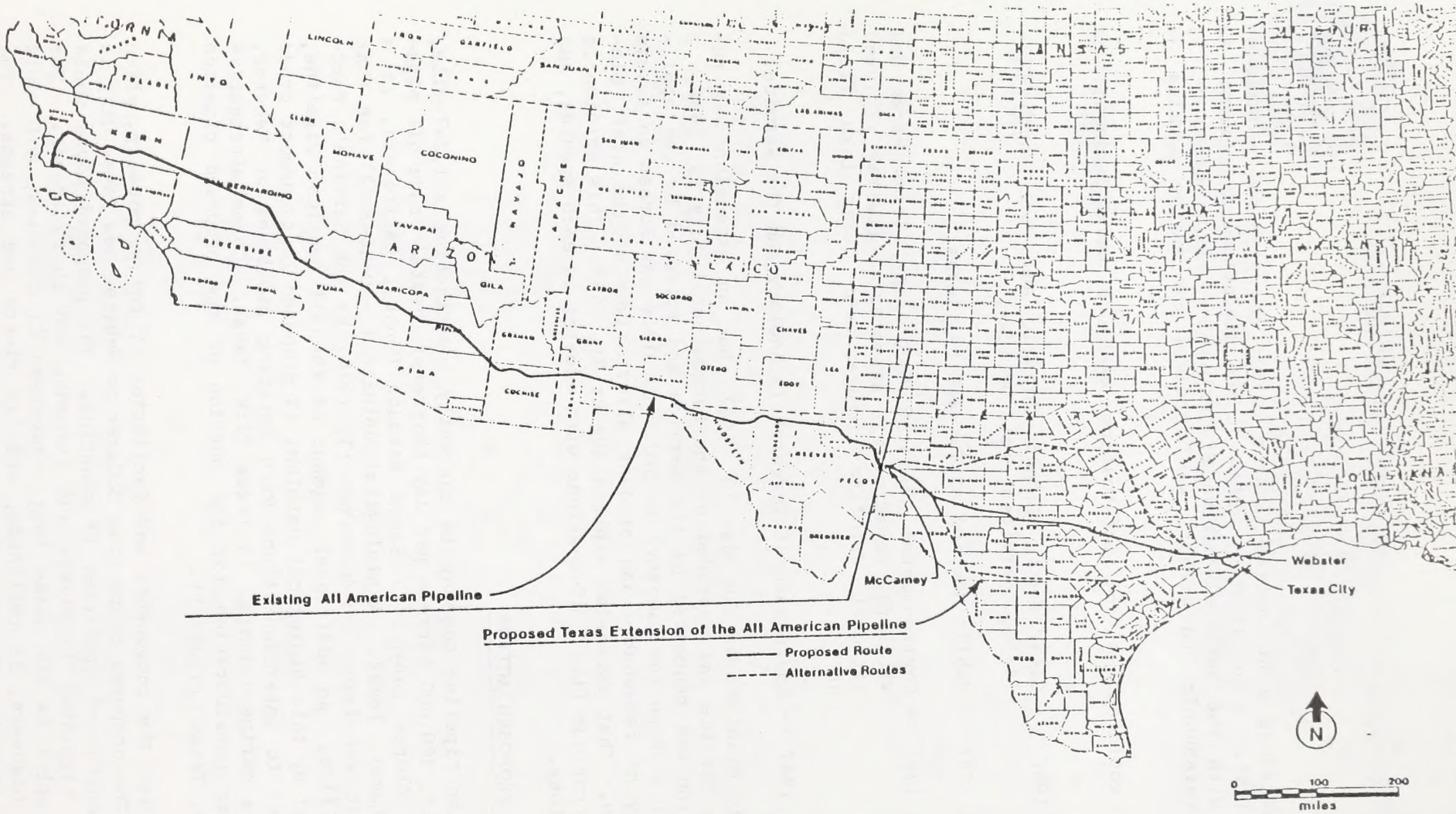

Figure 1 - REGIONAL SETTING

TABLE 1

PROJECT COMPONENTS AND FACILITIES

	Proposed Route	Northern Alternative	Southern Alternative
Facilities			
Total Pipeline length (miles)[1]	486	546	538
No. Pump/Heater Stations	5	6	6
No. Block & Check Valves	14 block (manual) 16 check (manual) 14 block (remote-control)	19 block (manual) 12 check (manual) 10 block (remote-control)	20 block (manual) 14 check (manual 10 block (remote-control)
No. Tank Farms[2]	0	0	0
No. Insulating Yards	1	1	1
Land Requirements			
Construction ROW[3] (acres) (Temporary disturbance)	5,887	6,615	6,518
Operation ROW[4] (acres) (Permanent disturbance)	2,944	3,307	3,259
Pipeline Stations[5]	24.2	28.8	28.8

Source: All American Pipeline Company

[1]Length includes the lateral to Texas City.

[2]All American would use the existing tank farm at McCamey; none required at Webster or Texas City.

[3]Assumes a 100-foot construction ROW.

[4]All american would have a 50-ft operation ROW following construction. Since the construction portion of the ROW would be returned to its preconstruction land use or vegetation type, permanent or on-going disturbance is not anticipated.

[5]Includes the pump/heater stations. Average station site is 4.8 acres.

The All American Pipeline would have the following specifications: 30-inch outside diameter; 0.281 to 0.500-inch wall thickness, with corresponding maximum allowable pipe operating pressure of 945 to 1,468 pounds per square inch gage pressure (pounds), respectively. For the area between McCamey and Webster, the maximum operating pressure in the pipeline would not exceed 900 pounds at 300,000 barrels throughout. A minimum of 20 miles of pipe downstream from each heater station would be insulated. In selected areas, such as river crossings, the pipe would be tape-coated and jacketed with concrete and/or weights. The entire pipeline would be protected from corrosion with a cathodic protection system.

Pipeline block and check valves would be located at strategic locations along the route. Block valves on the upstream (of oil flow) side of major river and stream crossings would be manually operated. Automatic check valves which close upon loss of pressure would be installed on the downstream (of oil flow) side of all major river and stream crossings. Remote-control block valves would be installed in all pump stations, at the Clear Creek pipeline crossing, at the Edwards and Ellenburger Aquifers, and at the intersection of the proposed route and the Texas City Lateral. Each block valve setting would require a 12-foot by 12-foot area. Remote-control block valves installed in the Ellenburger Aquifer and Edwards Aquifer crossings would be operated by an electric motor to open and close the valve. This system requires both power and communications. If necessary, these valves could also be manually operated. The pumping units would be equipped with monitoring systems (e.g., bearing temperature and pump vibration) to provide advance warning of impending equipment failures.

The proposed pipeline would be placed at a depth of 36 inches with construction beginning in the third quarter of 1987. All American's construction would require approximately one year and would be completed in the second quarter of 1988. The construction right-of-way width would be 100 feet. Where feasible, a smaller width would actually be used. The permanent (operation) right-of-way width would be 50 feet. Pipe storage and staging areas would typically not be needed along the right-of-way.

The pipeline would be buried at all water crossings, with the exception of Clear Creek (which would be directionally drilled), in accordance with U.S. Army Corps of Engineers nationwide and general permit requirements. All pipe used in these crossings would be coated with concrete. The pipe would be buried in the stream or riverbed at a depth of 4 feet below the probable scour depth of a 24-hour, 100-year flood. Where practical, all perennial stream crossings would be scheduled during the normal period of low stream flow.

IMPACTS OF THE ACTION

The potential project impacts to endangered species would result primarily from oil spills. Eight to nine spills averaging 3,400 barrels are estimated during the 40-year project life; the discharge of oil to a stream or river would potentially cause damage to threatened or endangered species (Table 2).

TABLE 2

COMPARISON OF IMPACTS
THE PROPOSED ALL AMERICAN PIPELINE AND ALTERNATIVES

	Proposed Route	Northern Alternative	Southern Alternative
General			
Linear miles (acres) of land	486 (5,887)	546 (6,615)	538 (6,518)
System Safety			
Expected number of spills in 40 years	7.8 (0.041)[1]	8.8	8.6
Average spill volume	3,350 barrels (2,400 barrels)[1]	3,350 barrels	3,350 barrels
ROW crosses areas sensitive to an oil spill	Yes	Yes	Yes
Groundwater			
Number of sensitive aquifers potentially affected	7	6	5
Miles of sensitive aquifers potentially affected	401	335	418
Surface Water			
Number of perennial stream crossings	11	8	15
Number of intermittent stream crossings	82	108	100

TABLE 2 (continued)

	Proposed Route	Northern Alternative	Southern Alternative
Geology			
Number of active surface faulting/ subsidence areas crossed	1	1	1
Aquatic Biology			
Number of streams crossed with important fish populations	11	16	20
Terrestrial Biology			
Miles (acres) of riparian vegetation disturbed	11.4 (138)	10.0 (121)	21.5 (260)

[1]Values for Edwards Aquifer recharge zone.

The northern alternative would cross 117 miles of the Edwards-Trinity Plateau Aquifer. The entire aquifer is considered to be sensitive; however, there are local variations in aquifer conditions which limit the potential adverse effects of an oil spill in some areas and cause other areas to be highly sensitive. Occurrence of an oil spill in an unfractured area or where fractures are filled with marl or soil would most likely be cleaned up at the surface before a significant volume of oil could infiltrate to an impact depth. If a spill occurred and entered a zone of open fractures or solution channels, then oil could migrate relatively rapidly through these zones.

The northern alternative avoids the highly sensitive Edwards Balcones Fault Zone Aquifer recharge area. Where the route crosses the Edwards Formation west of McGregor, the aquifer occurs in the subsurface, in a non-faulted condition, and outcrops in relatively small exposures along incised valleys.

Considering the historically low incidence of groundwater contamination resulting from reported oil spills and the response measures included in the Oil Spill Contingency Plan, not all of the predicted oil spills would result in significant impacts. There is, however, a small probability that significant impacts to groundwater quality could occur during the operational life of the project. Impacts would probably be of limited extend (i.e., <2 miles down gradient) and duration (i.e., several months to years). Under some conditions (e.g., fissured limestone aquifers with rapid recharge), the extent of contamination by dissolved crude oil constituents may be greater.

Spills into water channels such as creeks or rivers could also be significant. Although preventative measures and oil spill contingency plan procedures reduce the likelihood of a spill, a spill could occur. Such spills would cause direct mortality to fish and other aquatic life and would have secondary impacts through degradation of habitat. The extent of the impact would depend on the quantity and rate of flow for water in the water channel, as well as the magnitude, rate, and duration of the spill itself. A major spill could contaminate over 100 miles of riverine habitat. The duration of impacts would range from several months to 3-5 years, depending on the magnitude of the spill.

Construction and/or the possibility of a pipeline leak or rupture during operation of the project has the potential of affecting the following federally endangered species: Attwater's greater prairie chicken (*Tympanuchus cupido attwateri*); bald eagle (*Haliaeetus leucocephalus*); Concho water snake (*Nerodia harteri paucimaculata*); San Marcos gambusia (*Gambusia georgei*); San Marcos salamander (*Eurycea nana*); fountain darter (*Etheostoma fonticola*), Texas blind salamander, and Texas wild rice (*Zizania texana*).

Effects on Bald Eagles

Eagles are opportunistic feeders, with fish constituting the bulk of their diet. They will also feed on waterfowl and shorebirds, particularly sick or injured individuals, as well as carrion. Throughout most of the bald eagles's range, its population decline has been largely attributed to the effect of pesticide ingestion which resulted in eggshell thinning, and indiscriminate shooting of both immature and adult birds.

The two potential sources of impact to the eagle from pipeline activities are disturbance to its nests and the possibility of an oil spill contaminating the food source of the eagle. It can be expected that bald eagles might be attracted to the area of a spill by dead and dying fish and birds as a food source and, thereby, consume oil adhering to prey species. Nevertheless, evidence from other species of birds suggests that adult birds may be able to tolerate the ingestion of fairly high concentrations of crude oil. However, oil on plumage could adversely affect reproduction through contamination of eggs from adults carrying oil on breast feathers and feet.

In 1987, there were eight (8) active bald eagle nests in the area covered by this biological opinion: Bastrop (1), Colorado (1), Fort Bend (1), and Brazoria (5). In addition, there is a larger population of wintering bald eagles distributed throughout the upper Texas coast, with concentrations at reservoirs and major waterfowl wintering sites. These nests and winter concentrations are shown in Table 3.

The nest in Colorado County at the confluence of Skull Creek and the Colorado River (5.5 miles downriver of the pipeline crossing) was not active in 1987, but an alternate nest at South Point, two miles downstream of Skull Creek on the Colorado River, was active. The nest is more than seven miles from the pipeline, and no construction related impacts should occur. Oil could potentially reach this area if a spill occurred upstream at the Colorado River crossing associated with the proposed route.

The reported nest in Colorado County at Jay Ray along the Colorado River was not found in 1987. The reported nest in Wharton County northwest of Wharton along the Colorado River was not active in 1987.

The Eagle Lake/Brazos River/West Columbia area in Brazoria County had five active nests in 1987. Only one is directly along the Brazos River, but the other four are nearby. The nests are of concern only if there is a major pipeline rupture at the Brazos River crossing which is 16 miles upriver from these nests.

The nest in Fort Bend County, 1.9 miles from the pipeline, at the confluence of Rabbs Bayou and Big Creek (south of Worthington Lake), fell down in the summer of 1986 and was not active in 1987. However, it is likely that there is another active nest in the area (most alternate nests are within one or two miles of the primary nest). However, extensive surveys did not locate an alternate nest.

TABLE 3

BALD EAGLE NESTS AND WINTER CONCENTRATION AREAS

Location		Habitat	Distance from Pipeline
Proposed Route			
Bastrop County	Active nest	Confluence (Conf.) of Wilbarger Creek and Colorado River	20 miles to north
Colorado County	Active nest	Conf. of Skull Creek and Colorado River (several inactive alternate nest sites between Skull Creek and Jay Ray; the pipeline crosses through this area).	
Colorado County	Winter Concentration (Conc.) Area	Rice country around Eagle Lake.	Eagle Lake is 4 miles south, but feeding range may include pipeline crossing. There is no single roost location.
Kerr County	Winter Conc. Area	North Fork Guadalupe River	16 miles to south
Travis County	Winter Conc. Area	Hill Country Lakes around Austin along Colorado River.	Minimum distance approximately 21 miles to north.

TABLE 3 (continued)

Location		Habitat	Distance from Pipeline
Fort Bend County	Active Nest	Conf. of Big Creek and Rabbs Bayou, SE of Worthington Lake.	1.9 miles to south
Brazoria County	5 Active Nests 5 Inactive Nests	Triangle between Eagle Nest Lake, Brazos River, and West Columbia	16 miles to south
Northern Alternative			
Fort Bend County	Active Nest	Conf. of Big Creek and Rabbs Bayou, SE of Worthington Lake.	1.9 miles to south
Brazoria County	5 Active Nests 5 Inactive Nests	Triangle betwen Eagle Nest Lake Brazos River, and West Columbia.	16 miles to south.
Southern Alternative			
Wharton County	Inactive Nest	Several miles upriver of crossing on Colorado River, NW of Wharton. (There may be another nest in this area that has not been located).	2-3 miles to north.
Fort Bend County	Active Nest	Conf. of Big Creek and Rabbs Bayou, SE of Worthington Lake.	1.9 miles to south.
Brazoria County	5 Active Nests 5 Inactive Nests	Triangle between Eagle Nest Lake, Brazos River, and West Columbia.	16 miles to south.

The wintering eagle population near Eagle Lake in Colorado County was surveyed in January 1987. Bald eagles occur in the rice country around Eagle Lake during the winter and are attracted to this area because of the large population of wintering waterfowl. The eagles follow flocks of geese, taking healthy and injured birds. There is no single eagle roost area, although some areas may be used more than others, depending on waterfowl distribution. Three bald eagles were observed hunting waterfowl within 1/2 mile of the proposed pipeline route during a field survey on January 23, 1987. Since the eagles move over a fairly large area including Lissie, Garwood, and Provident City Prairies, which cover several counties, construction or operation of the pipeline should not seriously affect these wintering birds.

Effects on Attwater's Greater Prairie Chicken

The Attwater's greater prairie chicken (prairie chicken), once abundant along the coastal prairies of Texas and southwestern Louisiana (Lehmann 1941)[1], currently has a distribution limited to remnant areas of the Texas Gulf Coastal Prairie (Lehmann 1971)[2].

Estimated pre-settlement range of the prairie chicken in Texas included 3.4 million hectares (ha), of which approximately 2.4 million ha was good prairie chicken habitat and could have supported 1 million birds in peak years (Lehmann 1941). This decline corresponds with their loss of native habitat. Between 1975 and 1987, the prairie chicken population has declined from 2,040 to 1,103 birds.

The prairie chicken's mating season begins in late January or early February when the males assemble on short-grass areas early in the morning and late in the afternoon to boom and otherwise display the mating urge. Females are attracted to the courtship areas by this activity, and mating usually takes place there. Booming peaks in March and ends in May.

Nests containing eggs have been found from February 25 through June 17. The peak of the laying period, however, is in late March and April. Females build their nests in dry vegetation of the previous year, with preferred nesting sites located in good cover that is well-drained and within 5 yards of an open area. The peak of the hatching season is in May.

The All American Pipeline Project could potentially affect the Attwater's greater prairie chicken along the northern alternative in Austin, Fort Bend, Colorado, Galveston, and Brazoria Counties, and along the proposed route in Colorado, Fort Bend, Galveston, and Brazoria Counties.

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[1] Lehmann, V.W. 1941. Attwater's Prairie Chicken, Its Life History and Management. U.S. Dept. Interior, Fish and Wildl. Serv., N. Am. Fauna, 57. 65 pp.

[2] Lehmann, V.W. 1971. Attwater's Prairie Chicken. National Parks and Conserv. Mag. 25:1-4.

Based on information provided in the Attwater's Prairie Chicken Recovery Plan, the Texas Natural Heritage Program, and by Royce Jurries of the Texas Parks and Wildlife Department, it was determined that six areas near the northern alternative and proposed route had prairie chicken populations. Field surveys were conducted at three of these areas (Figure 2) on March 27, 1987, to determine the prairie chicken's status and habitat quality at the proposed pipeline routes. As a result, prairie chickens may be impacted at two areas of concern (Areas 2 and 3) which occur along the northern alternative.

Area 1 - Northwest of Sealy, Austin County. A booming ground (lek) was reported on the Hintz Ranch north of Interstate 10. This lek was active in the early 1980's (the peak was 25 males in 1980), but no birds have been seen in the past 4 years. The lek was visited on March 27 and 28, 1987, and no birds were heard. It appears that this population no longer exists, or so few birds occur in the area that no construction or timing constraints are necessary. Prairie chickens should not be adversely effected in this area.

Area 2 - South of Sealy, Austin County. An active lek occurs about 4.5 miles south of Sealy in mixed prairie and agricultural fields (Figure 3). The lek (5 males in 1987) is in a pasture/fallow field area near some high quality nesting habitat. This population is very isolated and appears to be restricted to this small area west of Highway 36. The northern alternative passes within 4,500 feet of this lek and does not cross any habitats regularly used by prairie chickens (i.e., nesting or feeding habitat). Most of the area crossed by the pipeline is cropland or heavily grazed pasture.

Since no important habitat would be affected by the pipeline, no timing constraints to avoid nests or young birds are recommended. However, it is possible that construction between 4:00 a.m. and 9:30 a.m. could disturb birds at the lek. All American has agreed not to construct between 4:00 a.m. and 9:30 a.m. in the vicinity of the lek, a distance of about 2 miles from north of Highway 3013 south past Highway 36. With this constraint, construction could then occur during the breeding season. It should take less than 10 days (one 5-day period for trenching, and another 5-day period to lay the pipe) for construction to pass through this area. Based on habitat conditions along the pipeline and the distance from the lek to the pipeline, no adverse effects are anticipated providing all construction during January through May occurs outside the 4:00 a.m. to 9:30 a.m. period.

Area 3 - Orchard, Fort Bend County. The northern alternative passes within approximately 400 feet of the only known active prairie chicken lek in Fort Bend County. This area is south of Orchard, just southeast of the Orchard Dome oil and gas field. Eight birds were observed at this lek in 1987 and over 30 male birds 6 to 8 years ago. This entire area is heavily disturbed. Oil and gas activity is concentrated in the west central part of this area (a triangle between Highways 36, Alt. 90, and 1489/1952), and 3

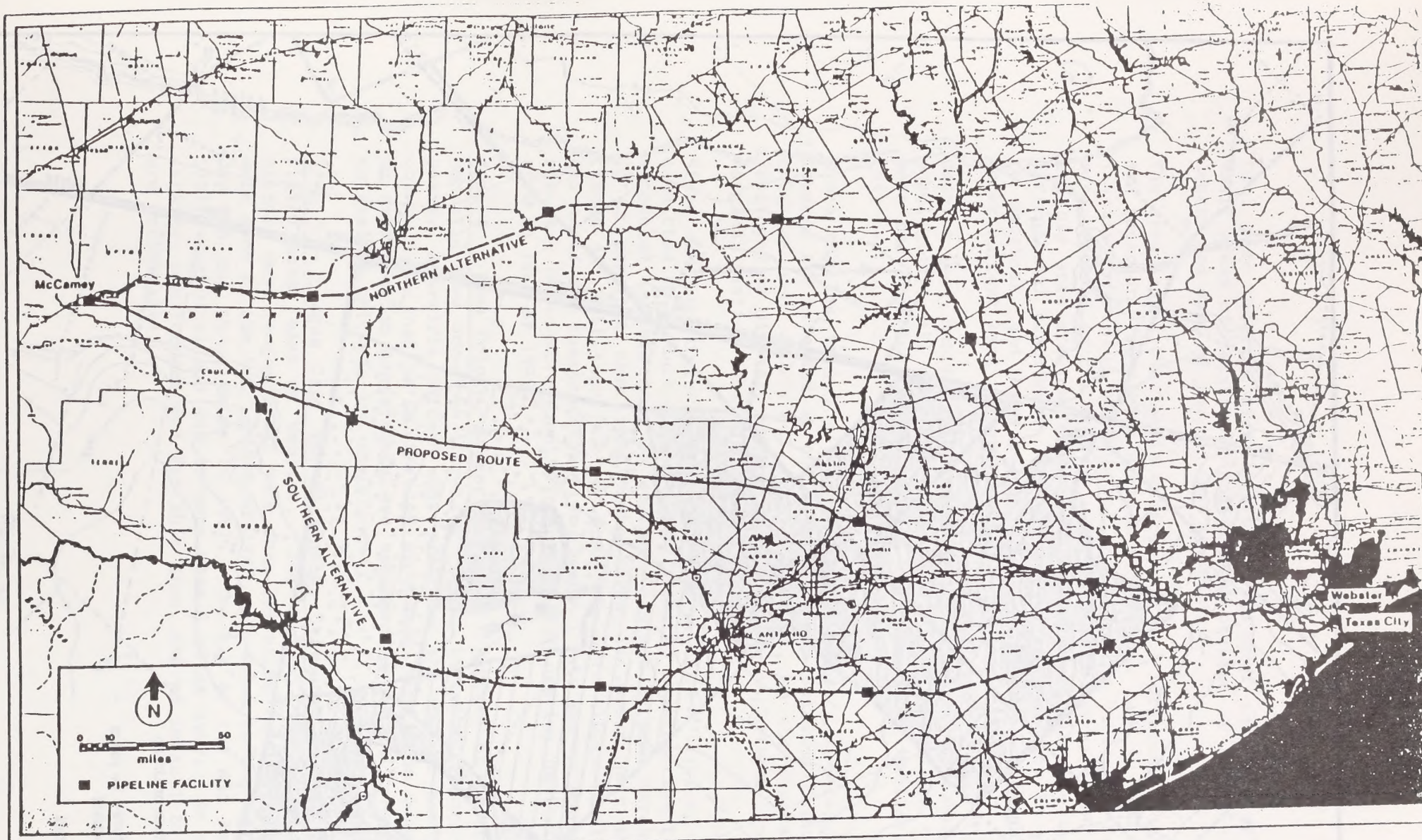

Figure 2 - MAP S-1 PROJECT LOCATION

Attwater's Greater Prairie Chicken Areas of Concern

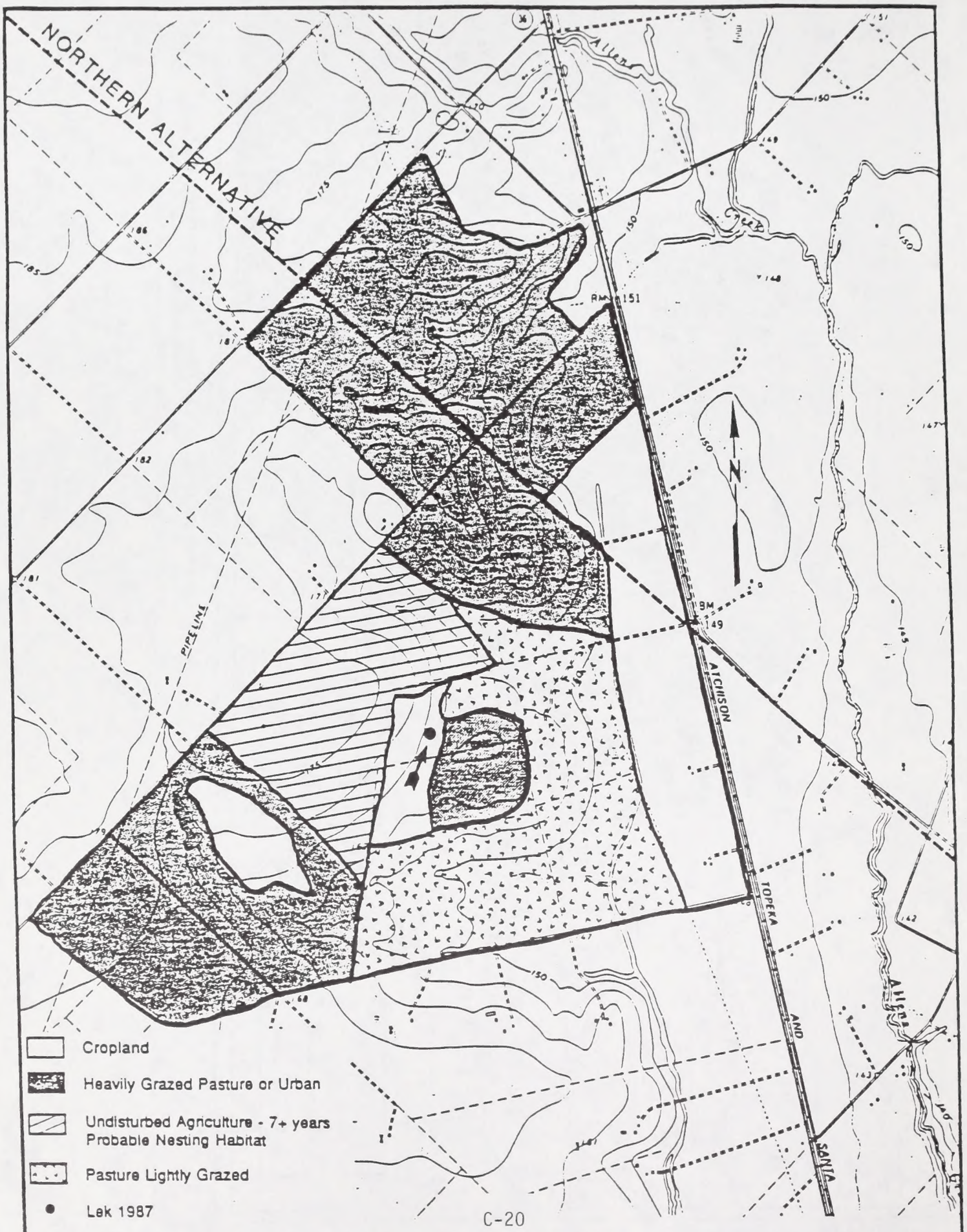

Figure 3 Prairie Chicken Population Near Sealy, Austin County

to 5 year rotation rice farming occurs over the rest of the area. Some small areas of relatively undisturbed prairie or fallow rice occur in the center and west of the oil and gas field.

The area around the lek is entirely in rice rotation. The prairie chickens are apparently surviving because some of the land is left fallow for up to 5 years, providing nesting and brood rearing habitat. Twenty-three birds were reported in the area by a farmer in mid-February 1987. The other leks in this area are now abandoned, possibly because they were eliminated by agricultural practices. The overall habitat quality in this area is poor to marginal, and long-term survival of prairie chickens is questionable under current land use practices.

Despite poor habitat, this area still supports a viable prairie chicken population. All American has agreed to avoid the lek by 1.5 miles, and move the pipeline north and east of the primary habitat. Nearly all of this realignment occurs in rotation rice.

Since the lek is 1.5 miles from the relocated pipeline, no noise-related impacts are expected at the lek during the breeding season. Most prairie chickens nest within 0.5 mile of the lek, so the chance of a nest being destroyed is minimal, especially since the realignment crosses through very marginal nesting habitat.

Since nesting disturbance is another potential impact, All American has committed to conduct a nest survey prior to construction if construction is scheduled in this area in suitable habitat between March 1 and August 1. It is possible that some young birds may occur near the open pipeline trench and fall into it. By August 1, most chicks should be able to fly and avoid the construction disturbance. This survey would not occur until the year of construction, since potential nesting habitat may be used for rice in 1987 or 1988.

Area 4 - Iowa Colony, Brazoria County. Reports of prairie chickens near Manville have occurred since the 1970's, including reports in the past few years. A prairie chicken was found near the town of Hobby in 1986. I do not believe that an active lek or viable population occurs in this area. No construction constraints are recommended for this area, and no impacts to prairie chickens are anticipated.

Area 5 - League City and Dickinson, Galveston County. Two active leks (1987) occur east of Webster. The nearest lek is at the Houston Gulf Airport near League City, more than 3.5 miles from the pipeline. No birds were seen at the lek in 1986 or 1987, but a lek to the southeast near Highway 646 had three males in 1987. The lek at the Rio Ranch (16 males in 1987) near Dickinson Bay is more than 6 miles away. No construction constraints are recommended for this area, and no impacts to prairie chickens are anticipated.

Area 6 - Attwater Prairie Chicken National Wildlife Refuge, Colorado and Austin Counties. Most of the active leks (10) are within the Refuge in Colorado County. These leks would not be disturbed by pipeline construction. Several active leks also occur outside the Refuge in Austin and Colorado Counties. Although these leks are within 3 miles of the pipeline routes (proposed and northern alternative), none are close enough to be effected by pipeline construction.

Prairie chickens will not be affected by construction of the proposed route. The only prairie chickens potentially affected by construction of the northern alternative is the population south of Sealy (Austin County) and southeast of Orchard (Ford Bend County). An early morning construction constraint at the lek south of Sealy should eliminate any potential impacts to this population. If the pipeline is maintained by mowing or shredding, this should not be done between January 1 and August 1 to avoid lek disturbance and possible destruction of nests or young birds.

Effects on the Concho Water Snake

The Concho water snake was listed as a threatened species on September 3, 1986. A decision on the final designation of critical habitat which was proposed on January 22, 1986, was deferred until economic data on the impact of that proposal could be assessed.

This water snake will not be impacted by either the proposed or southern routes. It is endemic to the Concho and Colorado Rivers in Runnels, Tom Green, Concho, McCulloch, Coleman, Brown, Mills, San Saba, Lampasas, and Irion Counties, Texas. It is a subspecies of the Harter's water snake with the only other subspecies being endemic to the Brazos River drainage in Texas. The Concho water snake was discovered in 1944 by J. Marr and was described as a distinct subspecies in 1961 by Tinkle and Conant. The snake reaches 3 feet in length with 21-23 dorsal row scales, four rows of dark brown blotches arranged in alternate fashion on the grayish-brown dorsal surface, and distinct to obscure dark spots along the pink to orange venter.

Both adult and juvenile Concho water snakes feed on small fish. Adults can live in either shallow or deep stream areas over a variety of substrates as long as there are sufficient, secure hiding places in proximity to nursery grounds. These areas usually have overhanging woody vegetation which is often used for basking sites. The juveniles, however, have more restricted requirements and occupy riffle habitat consisting of shallow, flowing water over a rocky substrate in conjunction with medium-sized flat rocks along the shore to provide thermal regulation and protective cover. These areas are typically unshaded for most of the day. Riffle frequency in occupied Concho water snake habitat ranges from 1.5 to 3 riffles per stream mile with the best habitat containing the highest number of riffles.

The Concho water snake has been eliminated from 28 percent of its known historic range through impoundment, diversion, degradation of water quality, and other human uses of the watershed. The limited range and narrow habitat requirements of this riffle-dwelling snake make its survival highly dependent upon protecting its habitat from further degradation.

The northern route for the All American Pipeline Project would cross the Colorado River within the proposed critical habitat for the Concho water snake in an area where Concho water snakes are known to occur. Project description information was obtained from the draft supplemental environmental impact statement and the biological assessment for the project. Site-specific data, including specifications of pipe which would be used, use of concrete sleeves, numbers and types of block and check valves, methods of crossing, ground preparation techniques, soil types and substrate, depths of pipe placement, and safety and spill avoidance measures were requested by the Service. Portions of this information were provided by the All American Pipeline Company in a June 12, 1987, letter. Project design features, which are included for this project reach, include minor realignments of the pipeline; reduction in construction right-of-way width and equipment use at the crossing; installation of a remote-control block valve and associated complementary check valves; and development of a site-specific oil spill contingency plan.

The draft supplemental environmental impact statement notes that without mitigation, populations of the Concho water snake could be significantly affected. The exact location and geology of the pipeline crossing for this area is not yet known. Excavation of the pipeline through riffled areas could result in direct loss of individual snakes. Excavation in pooled areas would be less likely to directly impact the Concho water snake, but could disrupt water quality downstream from the construction site, as well as impact flow regimes for adjacent riffled areas.

Of primary concern, however, is the potential for an oil spill into the Colorado or Concho Rivers or tributaries which feed into these rivers. Even spills of small magnitude would adversely impact this species through reduction of their prey base and direct effects on individual snakes. The draft statement also indicates there is a 48 percent probability that one or more spills would occur along the northern pipeline route during the 40-year life of the pipeline within threatened or endangered species habitat. The biological assessment notes that a large spill, although unlikely, could render this reach of the Colorado River unusable to the Concho water snakes for several months to 3-5 years until natural habitat conditions were restored. The amount of riverine habitat that would be impacted and the duration of the impacts would depend on the magnitude of the spill.

Regulations governing Section 7 of the Endangered Species Act of 1973, as amended, require the Service to consider cumulative impacts associated with a project. The Service's approach to assessing cumulative impacts is as follows: once the project has been defined, it is necessary to determine

an environmental baseline defining existing conditions for the affected area. The impacts of the project under review are then measured against this baseline.

In determining the environmental baseline, the Service considers the past and present impacts of all projects and human activities in the area, regardless of whether the activities are federal, state, or private in nature. The impacts of actions which are concurrently undergoing consultation are also considered in determination of the environmental baseline. Analysis of cumulative impacts also considers future state and private actions that are reasonably likely to occur.

Factors which must be included in this cumulative impact analysis include increased stream siltation due to land management practices in the watershed, the continued use of agri-chemicals which may affect the snake or its food base, changes in levels of point-source water pollution, and impacts associated with water impoundment. Impoundments impact Concho water snakes through inundation and loss of habitat, alteration of downstream flow regimes, and population fragmentation. Habitat of the Concho water snake has been affected by four large reservoirs on the mainstream Colorado and Concho Rivers, as well as several smaller impoundments on tributary streams.'

Of particular importance in this consultation is the current construction and proposed operation of Stacy Reservoir which will impound portions of both the Colorado and Concho Rivers. On December 19, 1986, the Service issued a jeopardy biological opinion with reasonable and prudent alternatives on this project. The damsite for Stacy Reservoir would be located approximately 4 miles above the proposed pipeline crossing on the Colorado River. The reservoir will adversely impact the Concho water snake by direct impacts due to inundation of its habitat and by indirect impacts associated with changes in flow regimes, population fragmentation, and increases in siltation. Reasonable and prudent alternatives were developed for the Stacy Reservoir project which would eliminate the risk of jeopardy to the Concho water snake. A primary factor in the reasonable and prudent alternatives is the creation and enhancement of riffle Concho water snake habitat below the damsite. Protection of that area is essential to the survival of this snake. An oil spill at the Colorado River crossing or in the associated drainage area would further threaten the critical status of this snake by adversely impacting its food base and other components of its habitat which may result in the death of some snakes because of a lack of food or the availability of suitable habitat.

Effects on the San Marcos Species

The San Marcos gambusia, San Marcos salamander, fountain darter, and Texas wild rice occur in the San Marcos River system in Hays County, Texas. Critical habitat has been designated for these species in various portions of the San Marcos River system from its headspring pool to approximately

4 miles downstream. The Texas blind salamander occurs in the underground aquifer system of the Edwards Plateau. These species are dependent upon the Edwards Aquifer for water supply. Because of the similarity of habitat needs and likely project impacts on these species, they are being considered as a group for the purposes of this analysis. These species require clear, clean, thermally constant waters. Any degradation in water quality or quantity of the aquifer would adversely impact these species.

These species will not be impacted by either the northern or southern pipelines. The proposed pipeline route would cross approximately 12 miles north of the habitat for these San Marcos species. Therefore, these species would be impacted if oil or its constituents reached this habitat via the groundwater due to an oil spill in the Onion Creek area (12 miles north). Several project design features have been incorporated to reduce the likelihood of a spill in this critical area. These features include use of pipeline with at least 0.5000-inch wall thickness; use of an epoxy coating; installation of additional remote-control block and check valves; a monitoring plan for Big Spring pool at the headwaters of the San Marcos to determine if oil is leaking into the area; and development of a site-specific oil spill contingency plan.

An engineering analysis has been done of the faulting and flow movements associated with ground water drainage from the Onion Creek area into the Edwards Aquifer which supports the San Marcos River system. Based on the biological assessment, an earlier analysis by the Corps of Engineers, and discussions with engineers associated with the project, the probability of a spill is unlikely to occur and, therefore, the San Marcos species are not likely to be impacted.

BIOLOGICAL OPINION

Based upon the preceding information, it is my biological opinion that the construction and operation of the All American Pipeline along the northern route is likely to jeopardize the continued existence of the Concho water snake.

It is my biological opinion that the construction and operation of the pipeline along the proposed, southern, and northern routes is not likely to jeopardize the continued existence of the bald eagle, Attwater's greater prairie chicken, or the San Marcos species.

I am concerned, however, with the welfare of several species along all three routes should a catastrophic pipeline rupture occur. These species include the bald eagle at the locations shown in Table 3; Attwater's greater prairie chicken locations northwest of Sealy, Austin County; south of Sealy, Austin County; Orchard, Fort Bend County, and at the Attwater Prairie Chicken National Wildlife Refuge in Colorado and Austin Counties. Also; the San Marcos gambusia, San Marcos salamander, fountain darter, and Texas wild rice located in the San Marcos River system and the Texas blind salamander could be impacted should an oil spill reach the Edwards Aquifer.

REASONABLE AND PRUDENT ALTERNATIVES

When a jeopardy opinion is issued, the Fish and Wildlife Service is required to include reasonable and prudent alternatives, if available, that allow the intent of the action to proceed while eliminating the jeopardy resulting from the federal action. The principle objective of these alternatives is to either eliminate or minimize the likelihood of an oil spill to the maximum extent possible within Concho water snake habitat. The following reasonable and prudent alternatives are provided for this species:

1. Select either the proposed or southern pipeline routes, or;

2. Select the northern route and implement the following stipulations:

   a) Conduct an on-site inspection of the Colorado River crossing to determine if juvenile snake riffle habitat occurs in the area. The area should also be evaluated for the presence of individual snakes. If the proposed crossing site contains riffled habitat, the pipeline route should be realigned to a nearby pooled area which will minimize impacts to individual juvenile water snakes.

   b) Additional riffle habitat should be created during pipeline construction by distributing the debris which occurs as a result of pipeline excavation. Specific construction techniques should be implemented which will minimize degradation of water quality, sedimentation, and erosion.

   c) A site-specific oil contingency plan should be developed to ensure that if a leak did occur, it would be detected and shut off rapidly. This plan should be prepared prior to project operation and must be acceptable to the Service. The plan should include such features as designation of equipment storage areas, maintenance program for equipment to ensure it is in proper working order, organization of response team, techniques to be used for spill containment and cleanup, and post spill restoration procedures.

   d) The area on both sides of the creek crossing and the crossings of other drainage areas that feed into the Concho or Colorado Rivers should be marked with pipeline signs at a maximum of 1,000 feet intervals which should be maintained annually to ensure their readibility. In addition, safety tape should be installed above the pipeline to warn people excavating in the area that there is a buried pipeline.

e) Visual inspections should be conducted at least 26 times per year, not to exceed a three week interval, for the pipeline route throughout the drainage area for Colorado River. The "pig" inspection should occur at least once every two weeks. These surveys should identify potential problems such as buckling or depressions near the pipeline, evidence of erosion, and potential leaks.

f) The pipeline should be coated with an epoxy coating to protect from corrosion.

g) Remote check and block valves should be used on either side of the Colorado River. These valves should have a manual capability and the block value be augmented with the remote terminal unit.

h) Multiple leak detection communications systems should be installed.

i) The concrete jacket, which will encase the pipe under the Colorado River, should be extended to the 100-year flood elevation.

INCIDENTAL TAKE

No incidental take of any species is anticipated to result from the proposed action. In the event that an incident occurs as part of and during the course of the activities covered by this opinion that could result in the incidental take of listed species, the activities causing the incident must be terminated and consultation must be reinitiated so the degree and amount of anticipated incidental take can be assessed and reasonable and prudent measures can be developed to reduce the levels of such take.

CONSERVATION RECOMMENDATIONS

Attwater's Greater Prairie Chicken

a) In order to avoid adverse effects on the prairie chicken booming grounds at Orchard, we recommend the realignment shown in Figure 4. Inspect the open trench each morning between April 1 and June 15 and remove any chicks that may have fallen in. Place these birds in a safe location near the trench.

b) Within one mile of the lek south of Sealy in Austin County, there should be no construction between 4:00 a.m. to 9:30 a.m. from January through May. Within two miles of this lek, there should be no mowing or shredding of the pipeline right-of-way between January 1 and August 1.

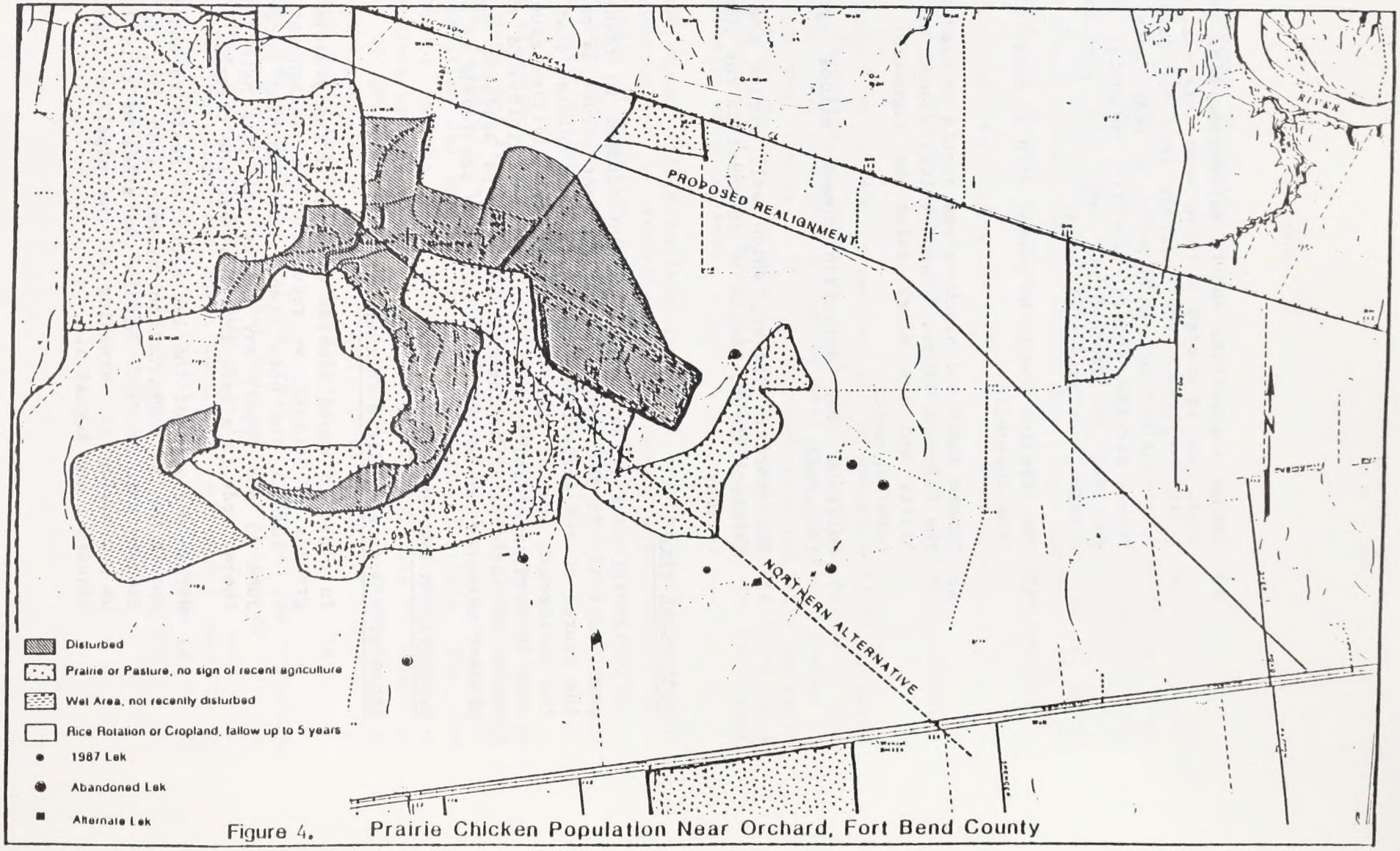

Figure 4. Prairie Chicken Population Near Orchard, Fort Bend County

Bald Eagles and San Marcos Species

a) In order to reduce the risk of failure from external pipe corrosion in critical areas, we recommend the use of epoxy-type coatings 100 feet before and 100 feet after all streams to be crossed by the pipeline where there are bald eagle nesting sites, as well as at the Edwards Aquifer Recharge Zone.

b) If construction is to be performed after October 15, 1987, within two miles of the confluence of Rabbs Bayou and Big Creek in Fort Bend County, another search for a bald eagle nest should be made. If a nest is found within 1 mile of the pipeline, no construction should be done between October 15 and May 15. If terrain or other natural features break the line of sight between the new nest location and the pipeline, the distance from the nest to the pipeline may be reduced to less than 1 mile after further consultation with the Service.

GENERAL

In order to enhance the response time for closing remote-control valves and shutting down of pump/heater stations, as well as providing a redundant leak detection system, we recommend a responsive back-up communications system for pipeline operation over and above the leased commercial communications system now provided for.

PROPOSED SPECIES

The black-capped vireo (*Vireo atricapillus*), which is a proposed endangered species, occupies habitat contiguous to all three pipeline routes. The impact of the project upon this species is currently being conducted within the informal Section 7 consultation process. We anticipate this species will become listed by or before February 1988.

Further consultation for listed species is not required unless new information reveals effects of the action not considered in this biological opinion, or new species are listed that may be affected by this action, or the proposed action is subsequently modified in a manner not considered in this opinion.

I appreciate the Bureau's cooperation on this project. Because this is an adverse biological opinion, you must notify me as to what your final action will be on this project.

cc:
Director, FWS, Washington, D.C.
Executive Director, Texas Parks and Wildlife Department, Austin, TX
Field Supervisors, Ecological Services, FWS, Fort Worth, Houston, and Corpus Christi, TX
Regional Director, FWS, Portland, OR (FWE)

ACRONYMS AND ABBREVIATIONS

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The following acronyms and abbreviations appear in the response to comments.

AF	- acre-feet
AAPL	- All American Pipeline Co.
API	- American Petroleum Institute
BA	- Biological Assessment
bbl	- barrels
bgs	- below ground surface
BLM	- Bureau of Land Management
BPD	- Barrels Per Day
CEQ	- Council on Environmental Quality
CERCLA	- Comprehensive Environmental Response, Compensation and Liability Act
cfs	- cubic feet per second
CO	- carbon monoxide
dBA	- decibels A-weighted
DOT	- Department of Transportation
DWT	- Dead Weight Ton
EKMA	- Emperical Kinetic Modeling Approach
EPA	- Environmental Protection Agency
ft	- feet
gpm	- gallons per minute
lbs/day	- pounds per day
mg/l	- milligrams per liter
MOA	- Memorandum of Agreement
NAAQS	- National Ambient Air Quality Standards
NEPA	- National Environmental Policy Act
NO_2	- nitrogen dioxide
NO_x	- nitrogen oxides
NPDES	- National Petroleum Discharge Elimination System
O_3	- ozone
OPEC	- Organization of Petroleum Exporting Countries
OSHA	- Occupational Safety and Health Administration
PADD 3	- Petroleum Administration for Defense District 3
PADD 5	- Petroleum Administration for Defense District 5

ACRONYMS AND ABBREVIATIONS (CONTINUED)

PAH	- polyaromatic hydrocarbons
Pb	- lead
PM	- particulate matter
PMOA	- Pogrammatic Memorandum of Agreement
RACT	- reasonably available control technology
ROW	- Right-of-Way
SCS	- Soil Conservation Service
SEIS	- Supplemental Environmental Impact Statement
SIP	- State Implementation Plan
SO_2	- sulfur dioxide
TACB	- Texas Air Control Board
TERC	- Texas Emergency Response Center
TNHP	- Texas Natural Heritage Program
TOC	- total organic carbons
TOES	- Texas Organization of Endangered Species
TPWD	- Texas Parks and Wildlife Department
TRC	- Texas River Commission
TRRC	- Texas Railroad Commission
TSP	- Total Suspended Particulate
TWC	- Texas Water Commission
µg/l	- micrograms per liter
USFWS	- U.S. Fish and Wildlife Service
USGS	- U.S. Geological Survey
VOC	- Volatile Organic Compound

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